APPENDIX C

BLDG. 1003
PHOTOGRAPHS, EVALUATION, SEISMIC ANALYSIS, DEFICIENCIES AND COST

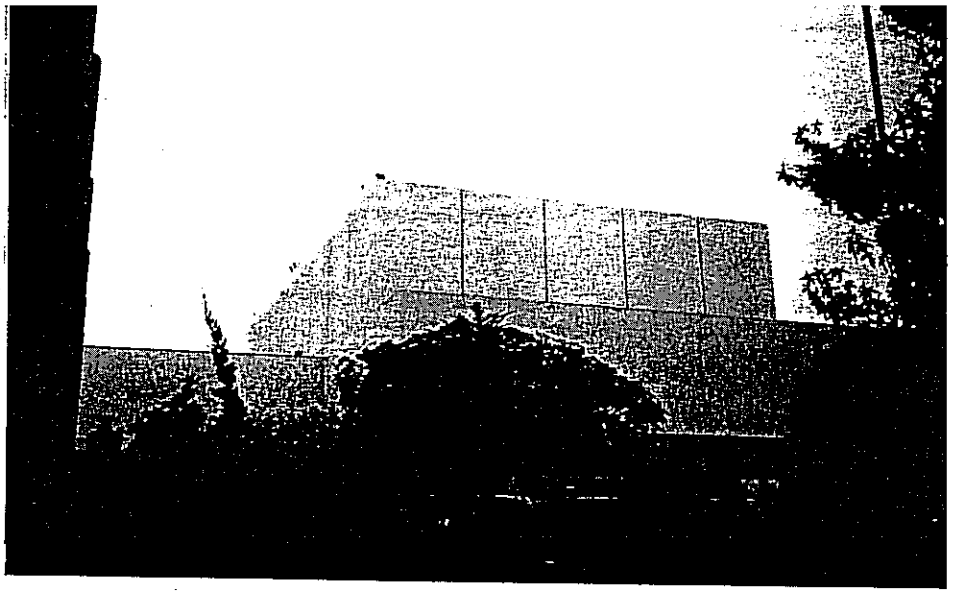
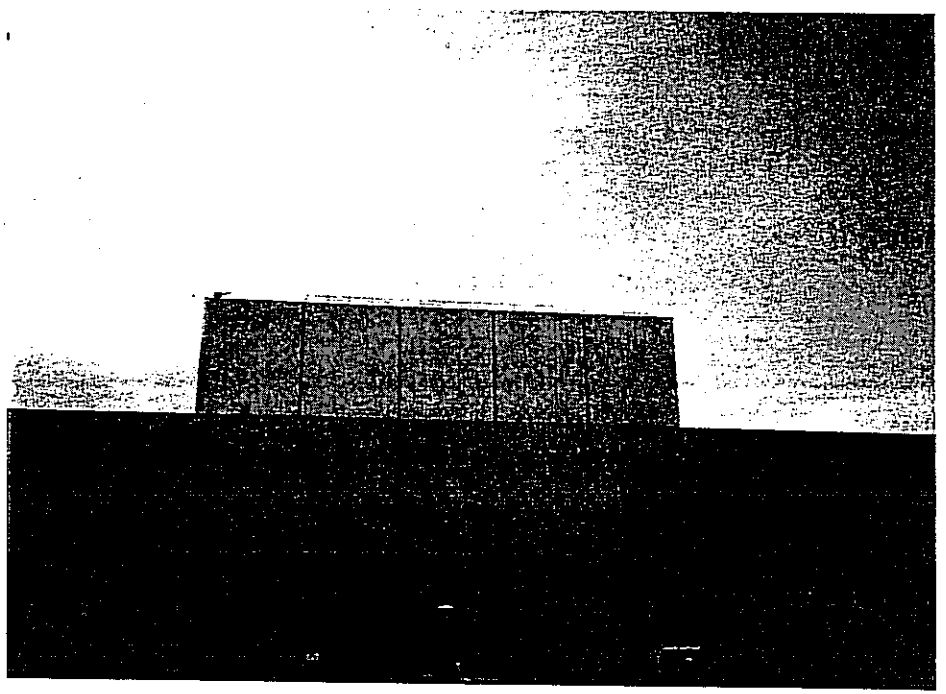


Photo 1. North view of Building 1003 behind, surrounded by Buildings 1001 and 10031 in foreground.



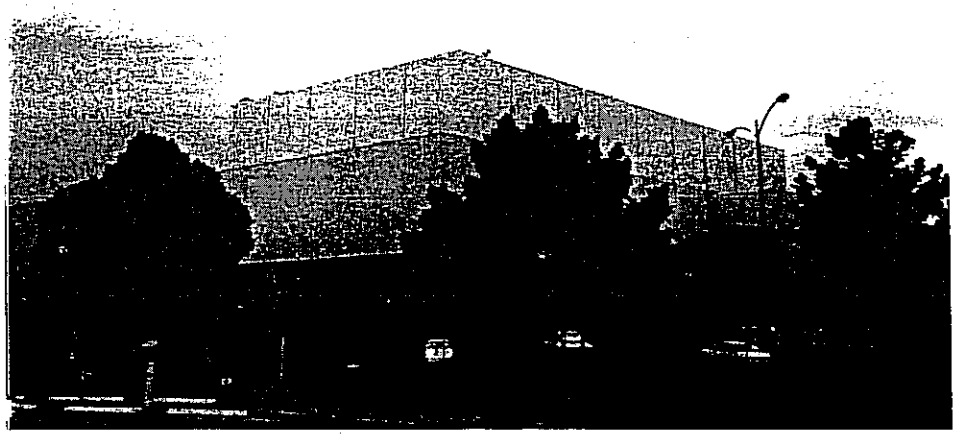


Photo 3. Northwest view of Building 1003 behind, surrounded by Buildings 10031 and 10032 in foreground.

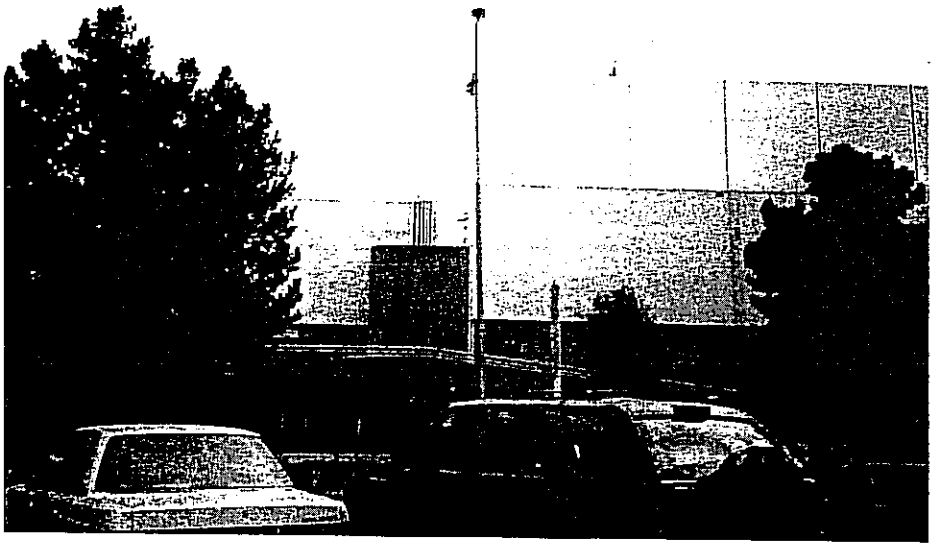
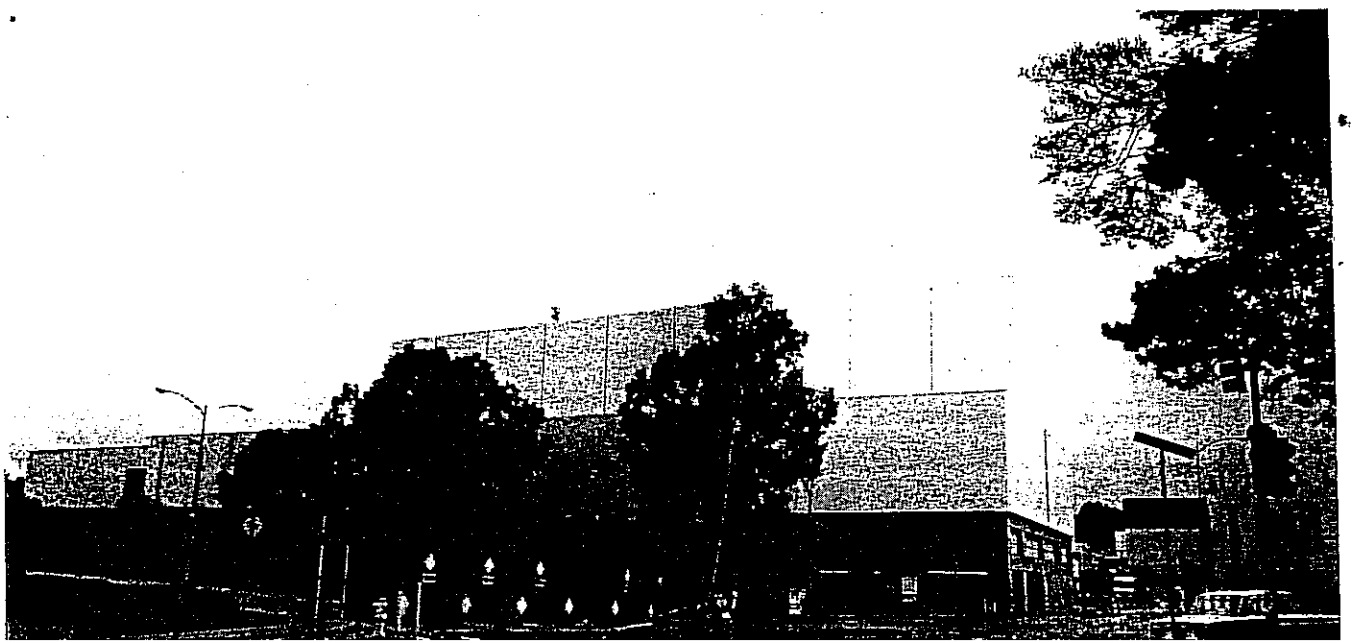


Photo 5. West view of Building 1003 behind, surrounded by Building 10032 in foreground.



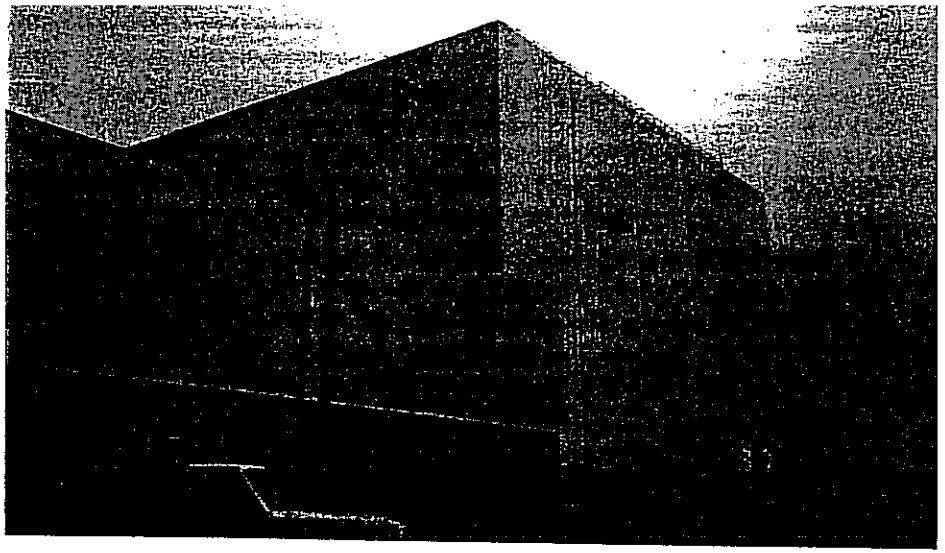
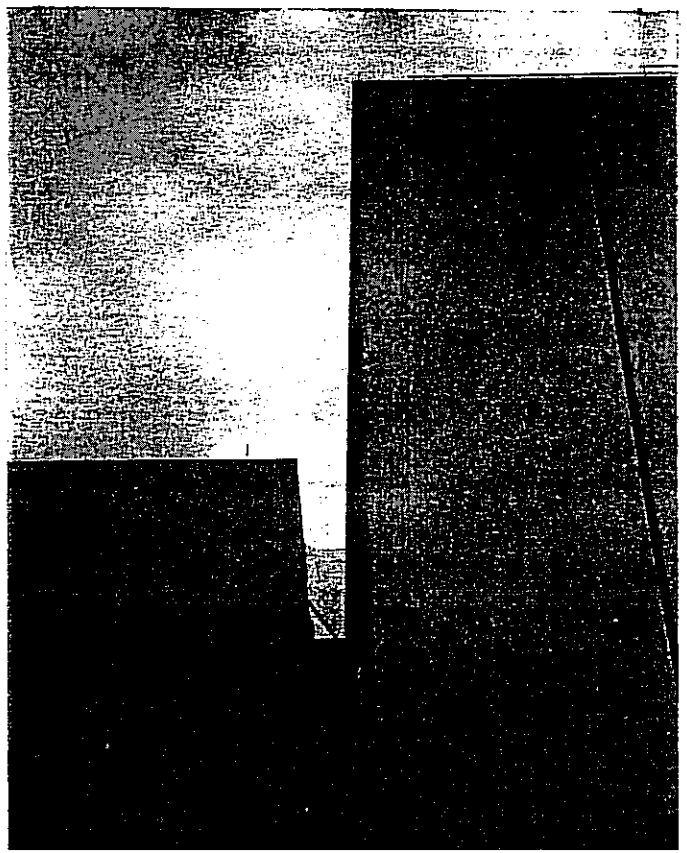


Photo 7. South view of Building 1003 behind, and Building 10032 in foreground.



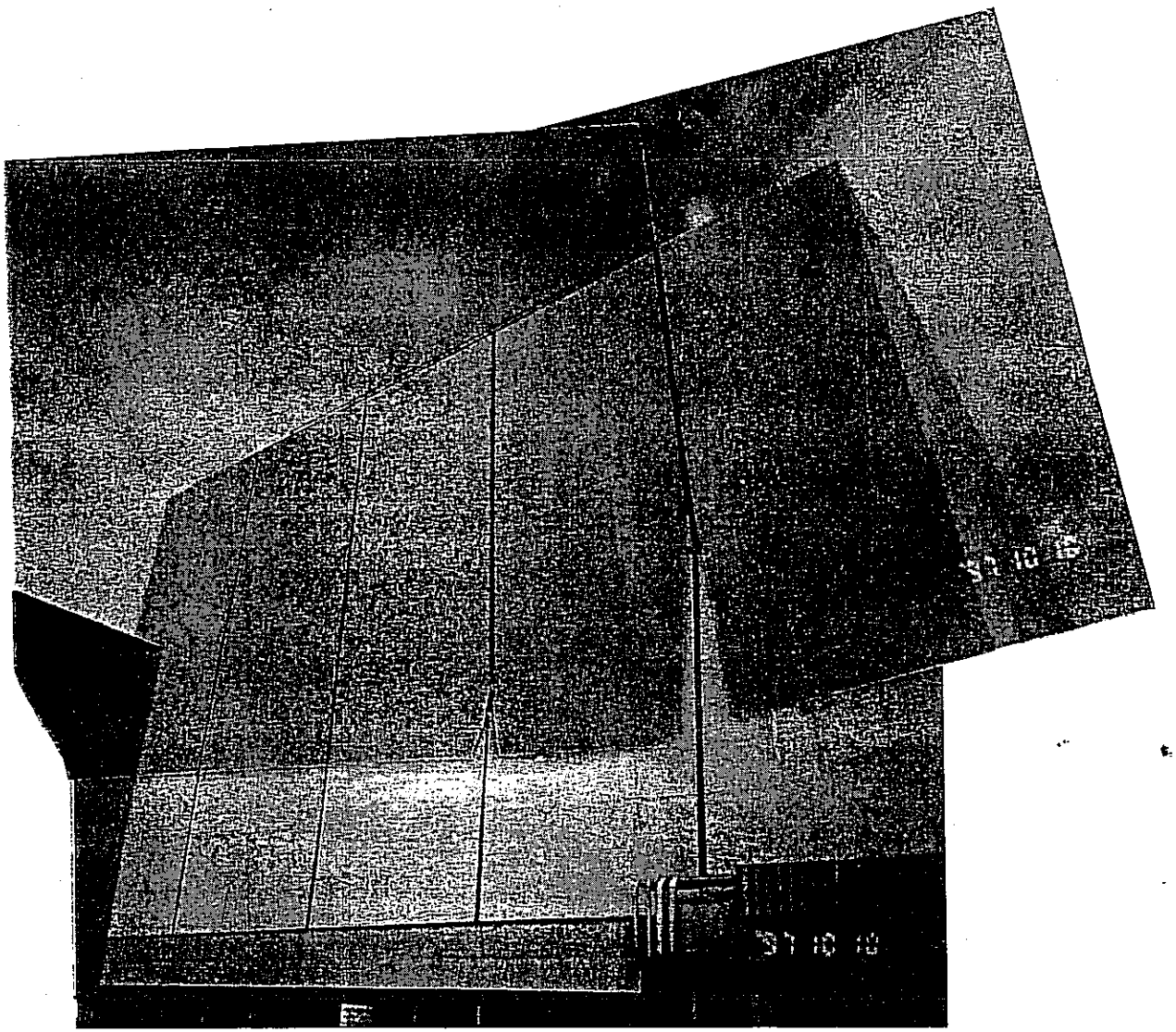


Photo 9. South close-up view of Building 1003.

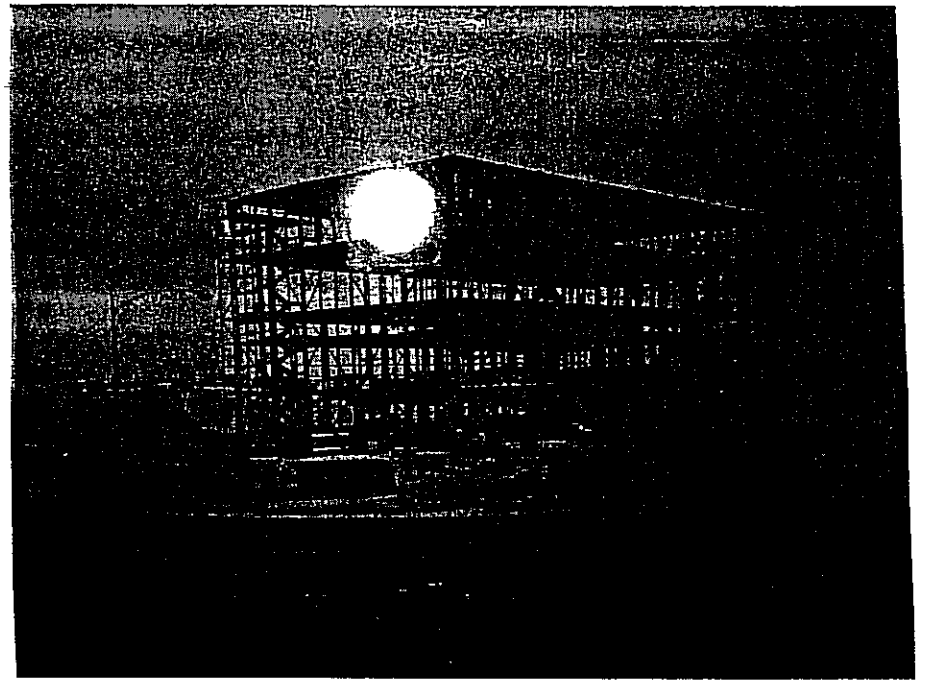


Photo 10. Existing photograph of the construction of Building 1003 as displayed in Lobby. Notice the framing of four story levels with 19 to 25 feet story heights.

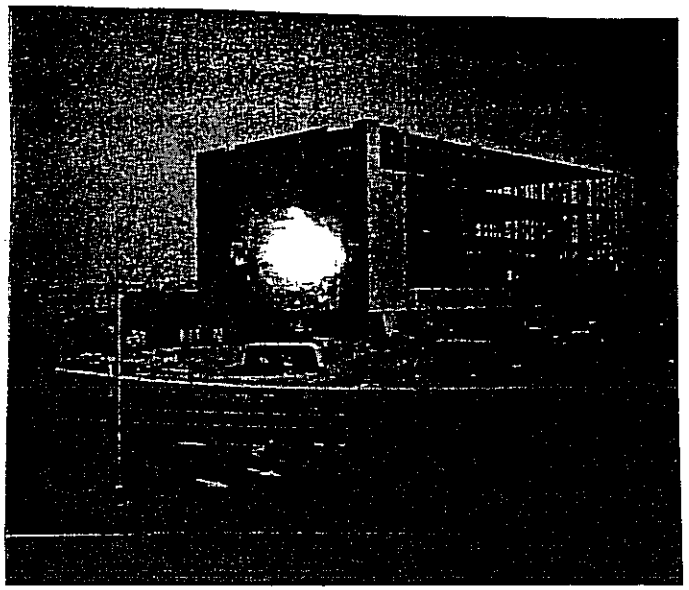
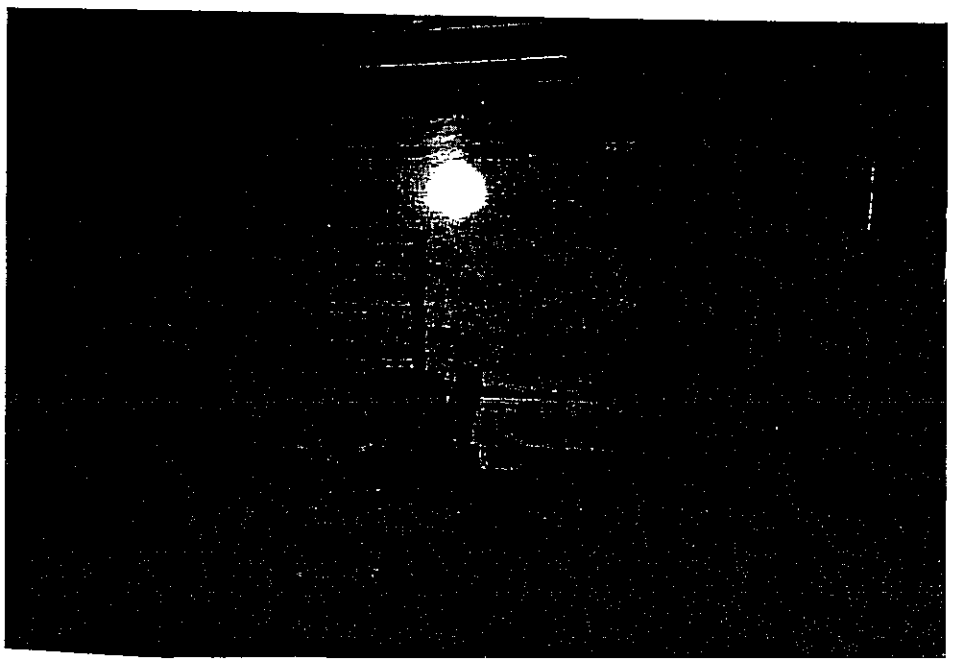


Photo 11. Existing photograph of the construction of Building 1003 as displayed in Lobby. Notice the

Photo 12. Existing photograph of the failure of a gusset plate following the 1989 Loma Prieta Earthquake. The failure is located in the cracked plate at the joining of a diagonal brace to the column. This was discovered accidentally during the reconstruction of a third floor bathroom. The crack was repaired but there is no information on whether a study was performed to inspect and evaluate all other similar connections in the building.



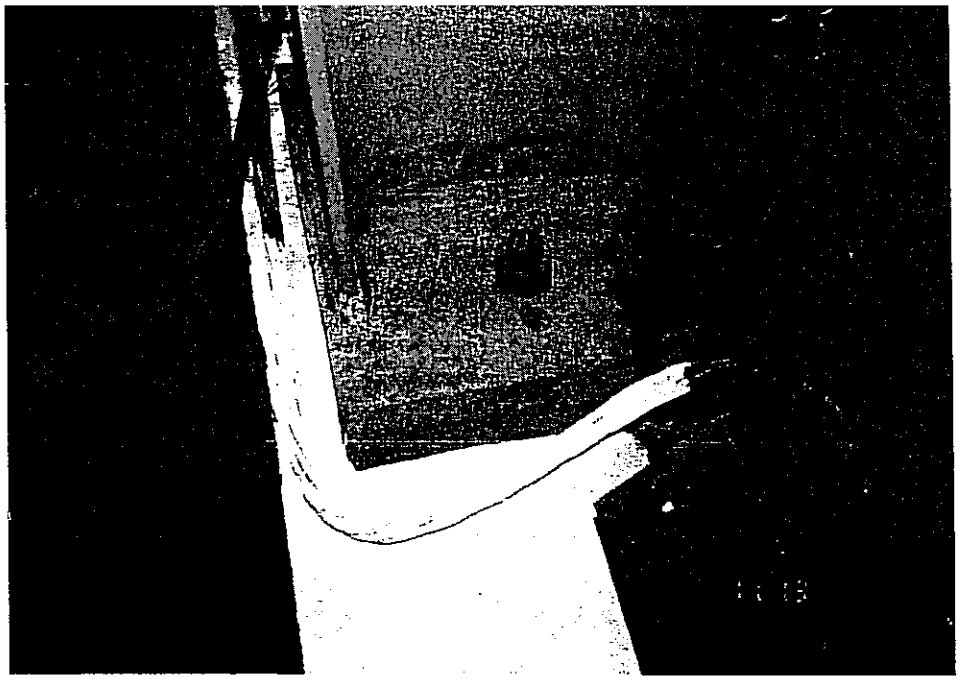
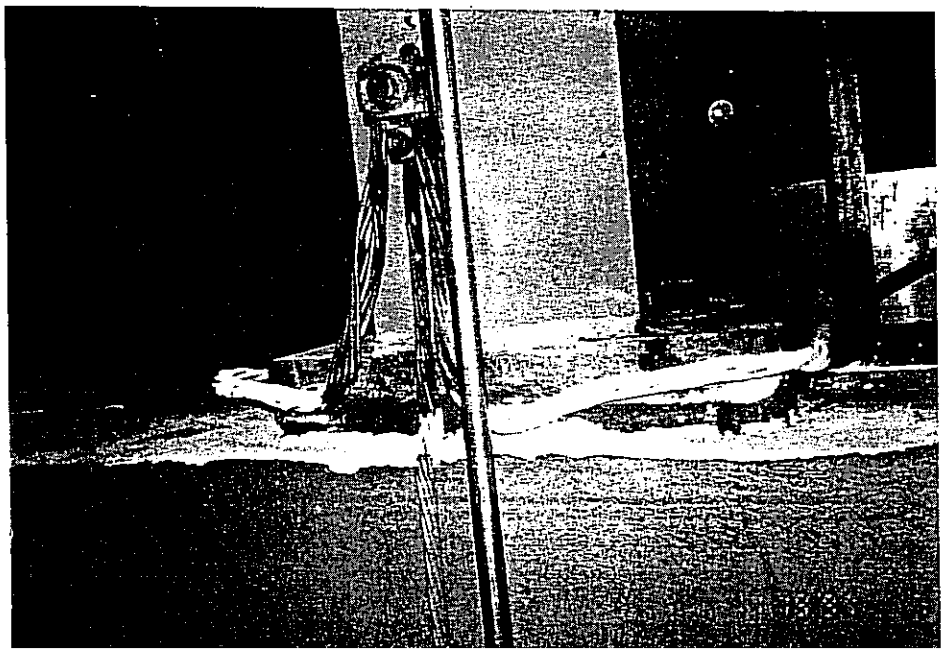


Photo 14. Typical column base anchorage to grade beam as seen on the ground floor mechanical room. Notice the connection and bolt installation are not designed as a moment connection.



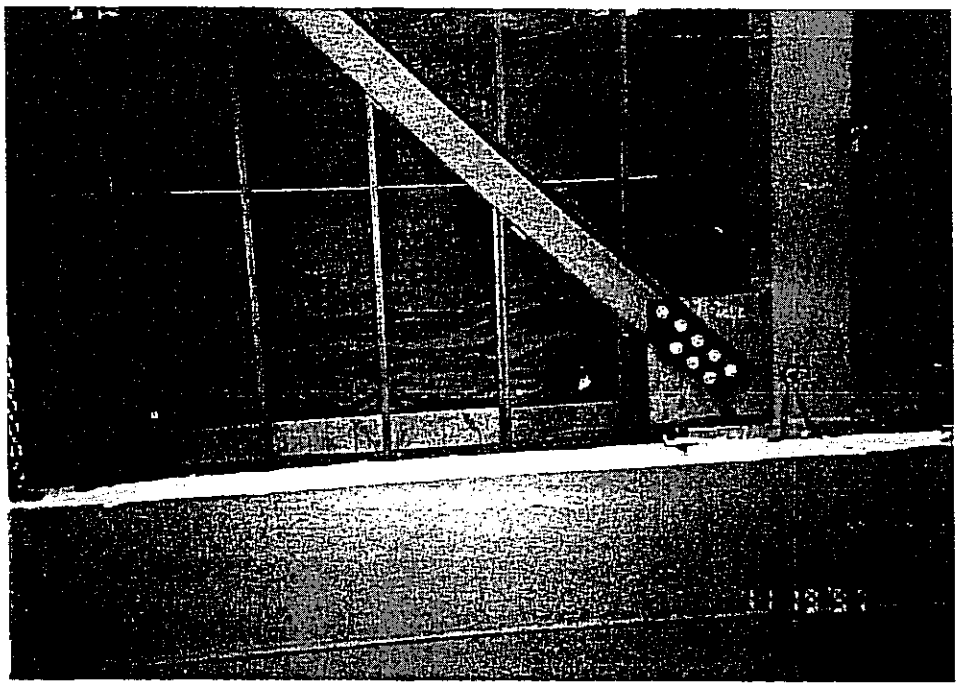
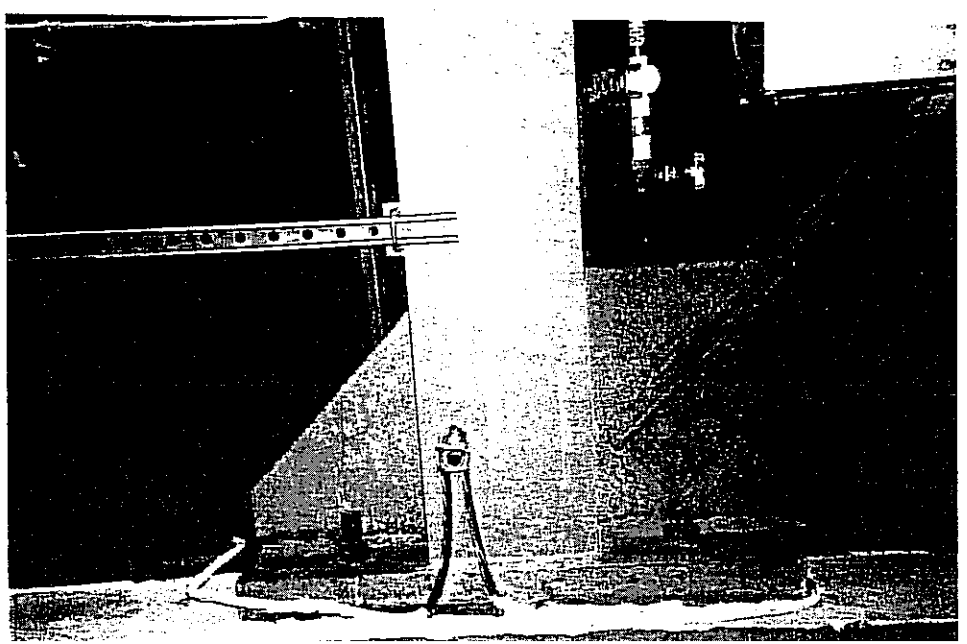


Photo 16. Typical diagonal bracing along building perimeter for lateral shear.



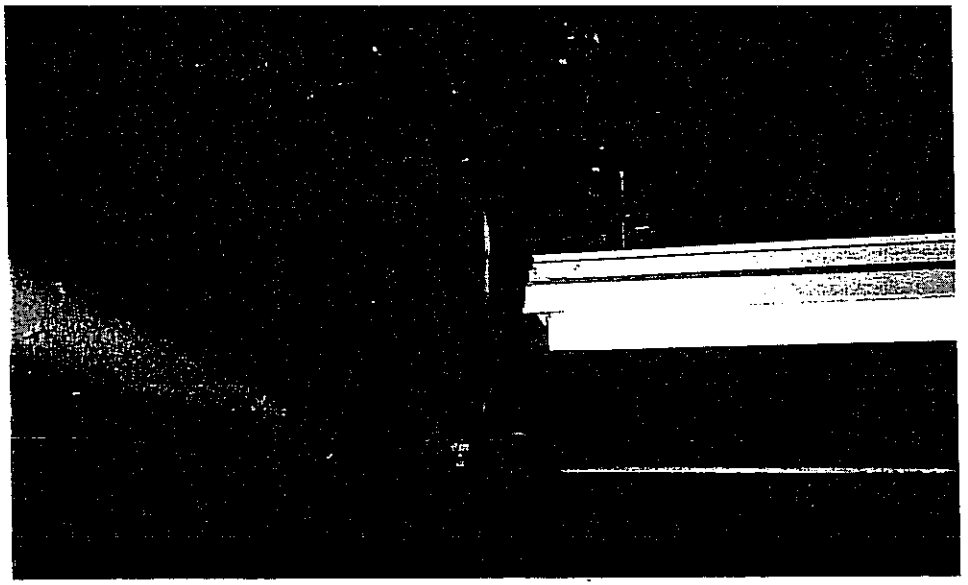
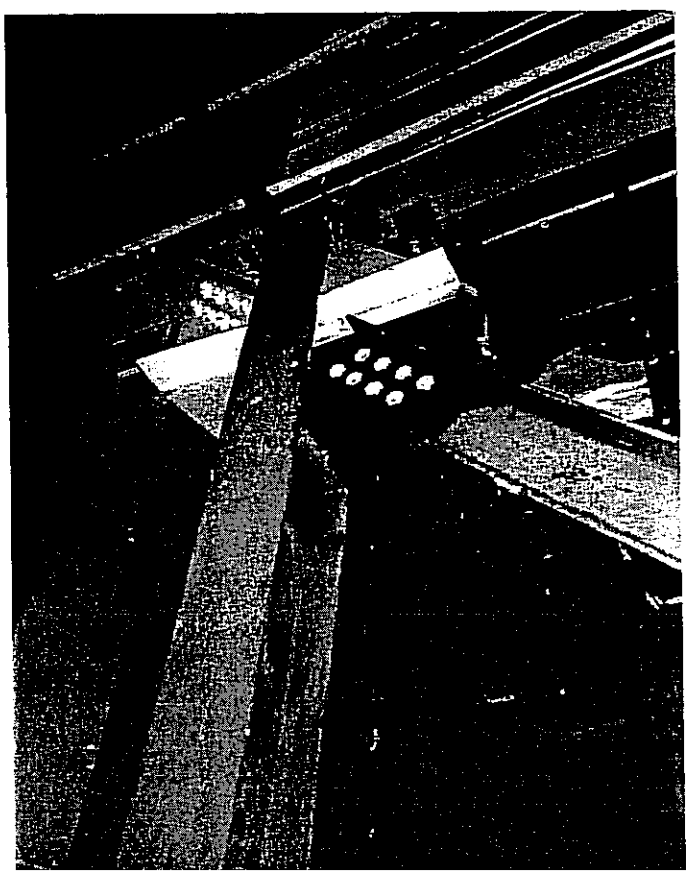


Photo 18. Typical connection of diagonal bracing to column top.



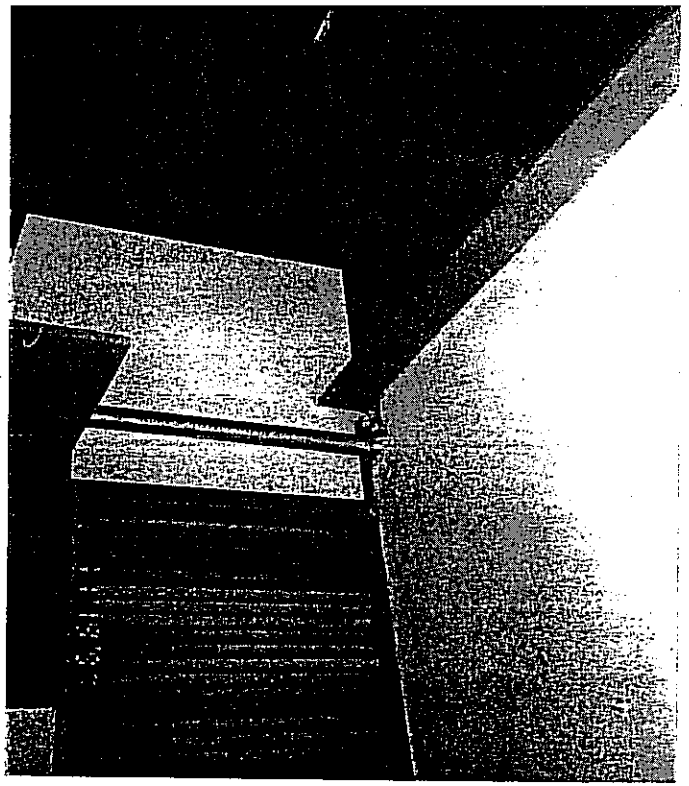
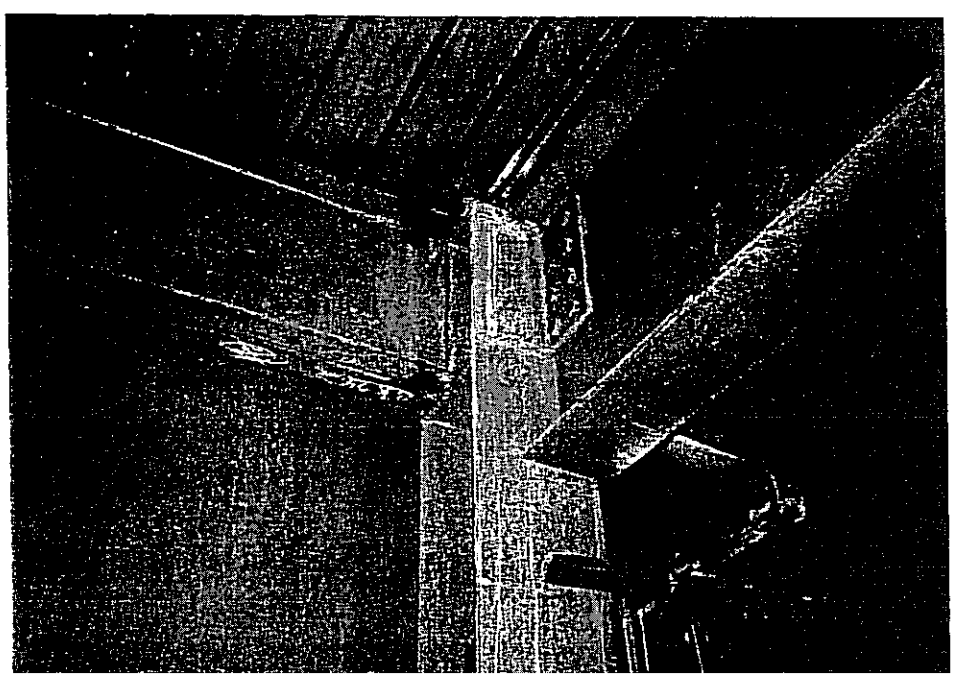


Photo 20. Typical connection of floor beams to column top. Notice the connection is not designed as a moment resistant connection. The steel deck floor is tack welded to the floor joist.



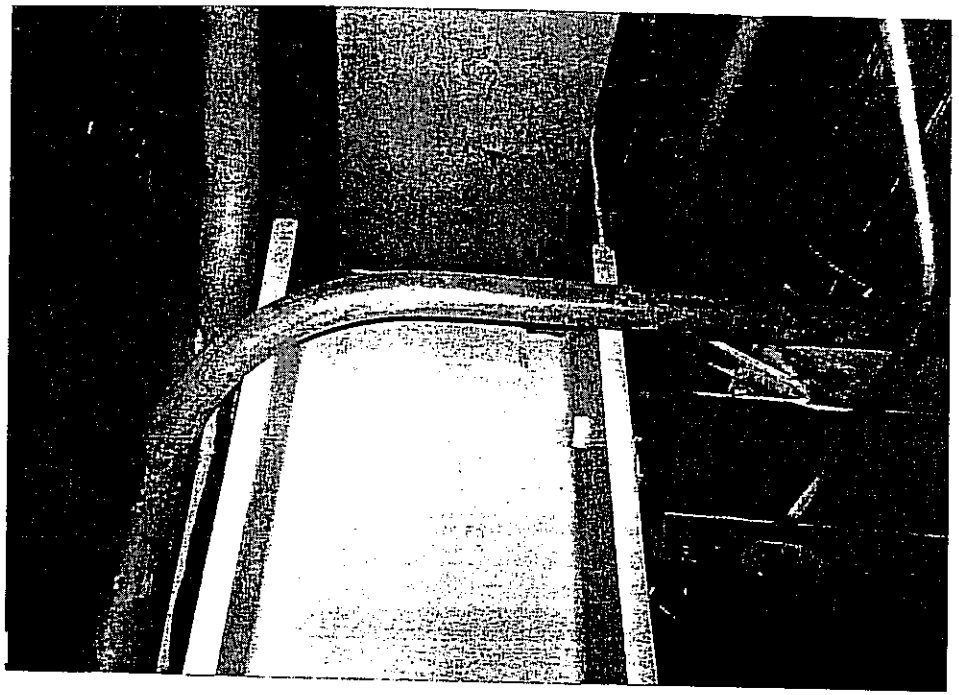
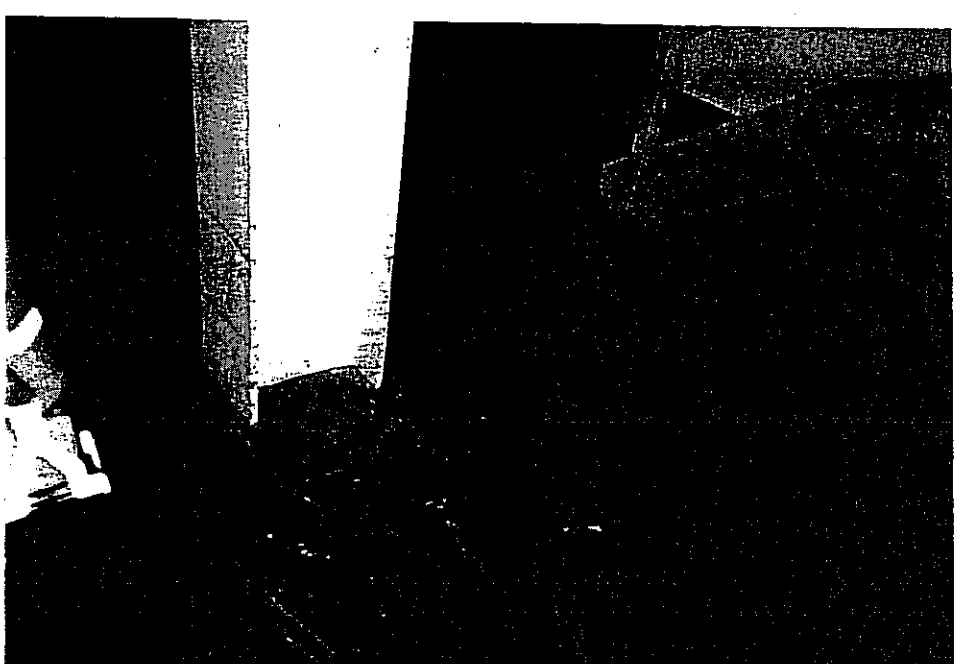
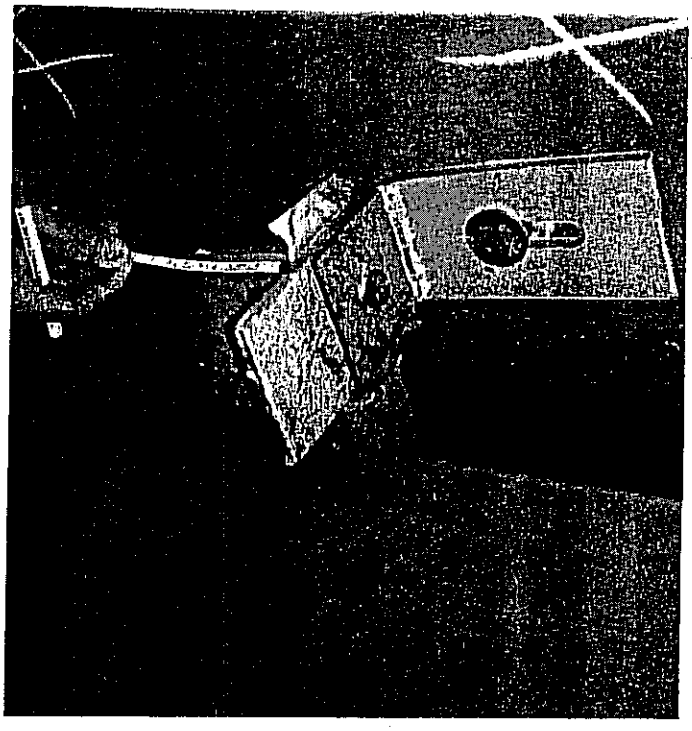
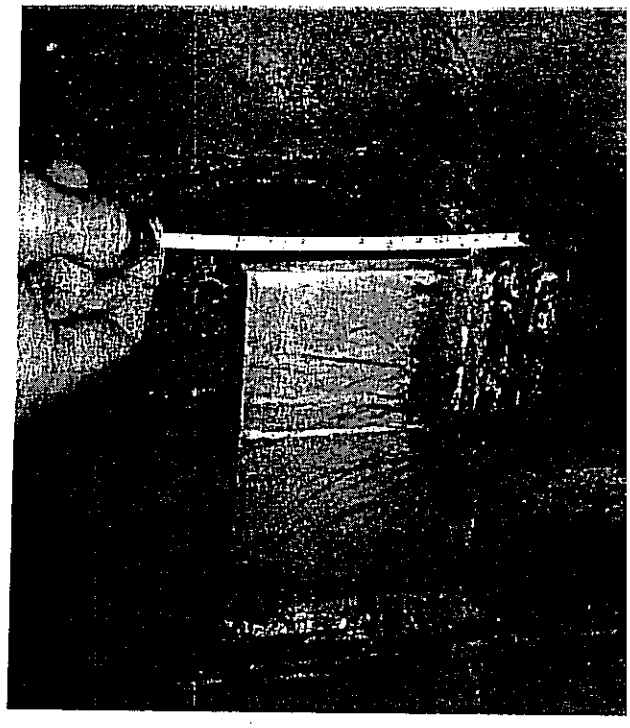
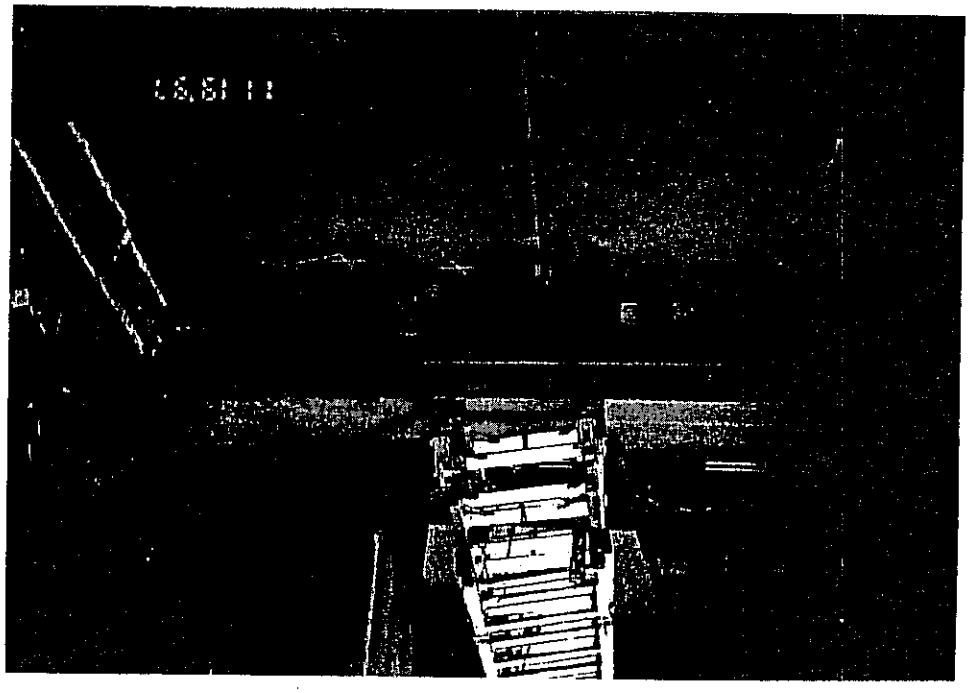


Photo 22. Another view of the connection of floor beams to column top. Again, notice the connection is not designed as a moment resistant connection.









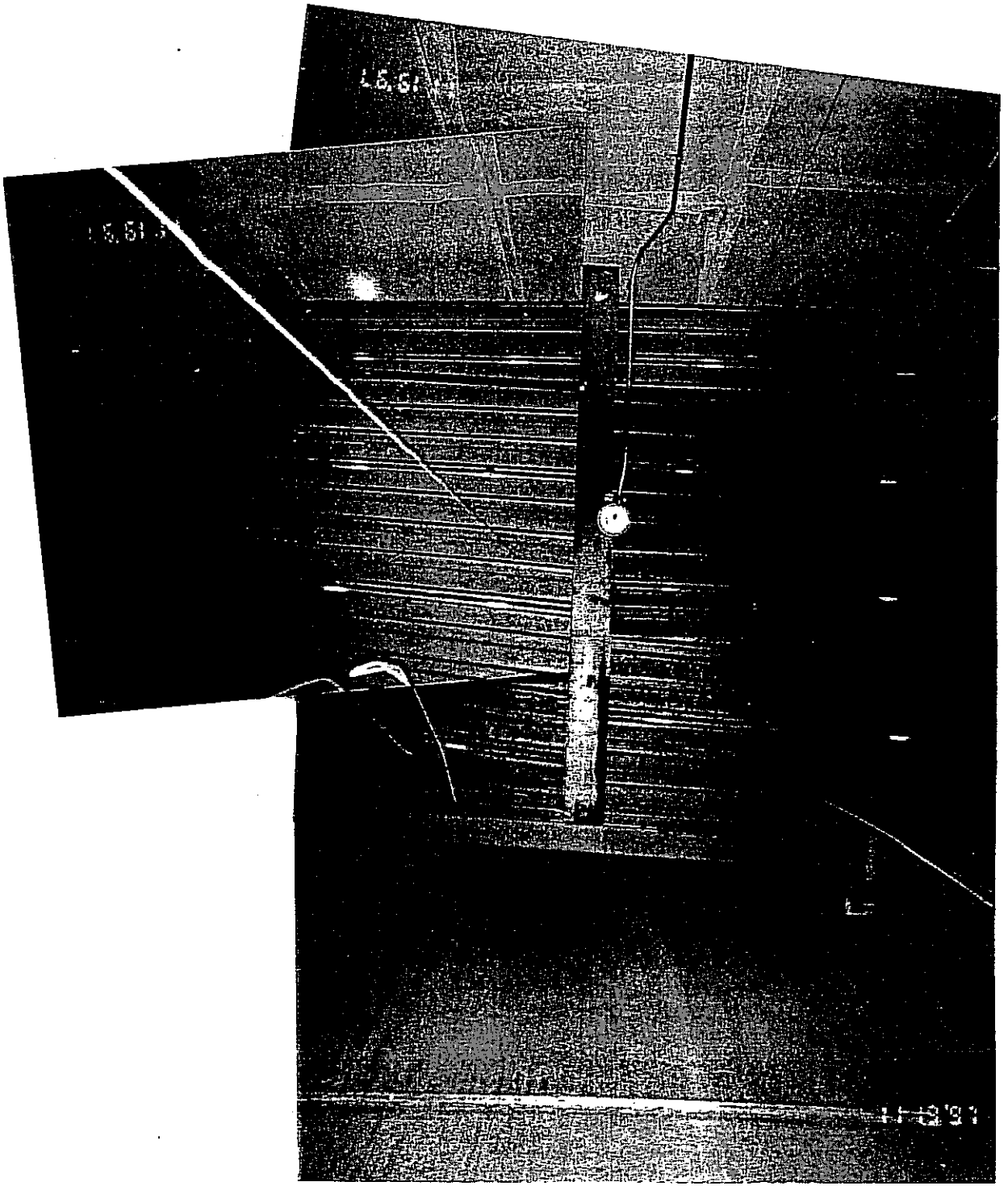


Photo 25 Underneath view of the typical steel deck floor. The floors consist of a concrete slab over a

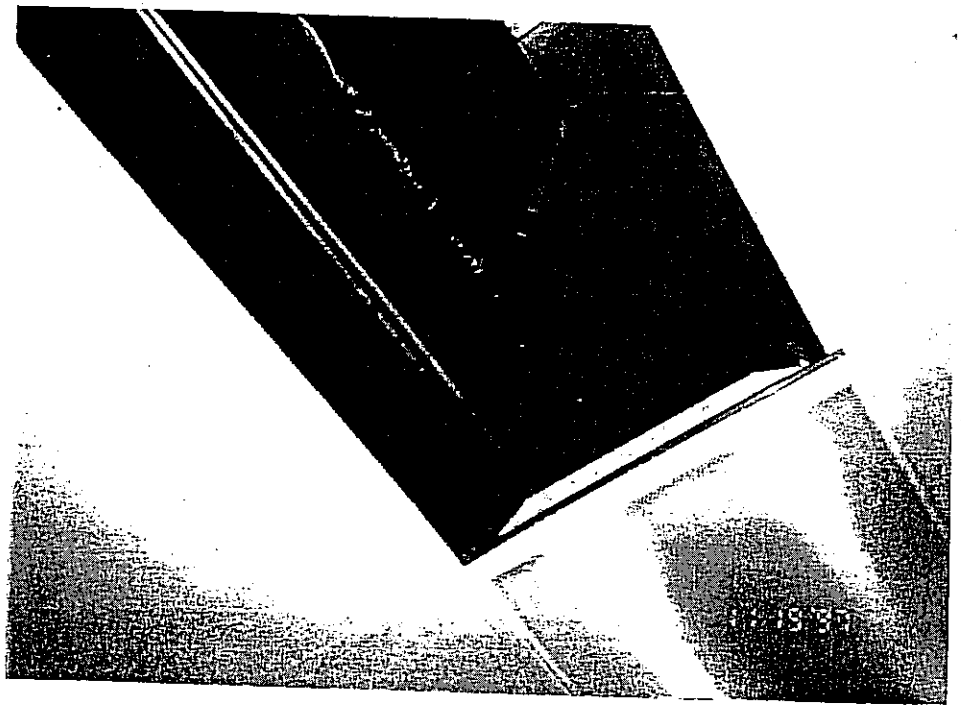
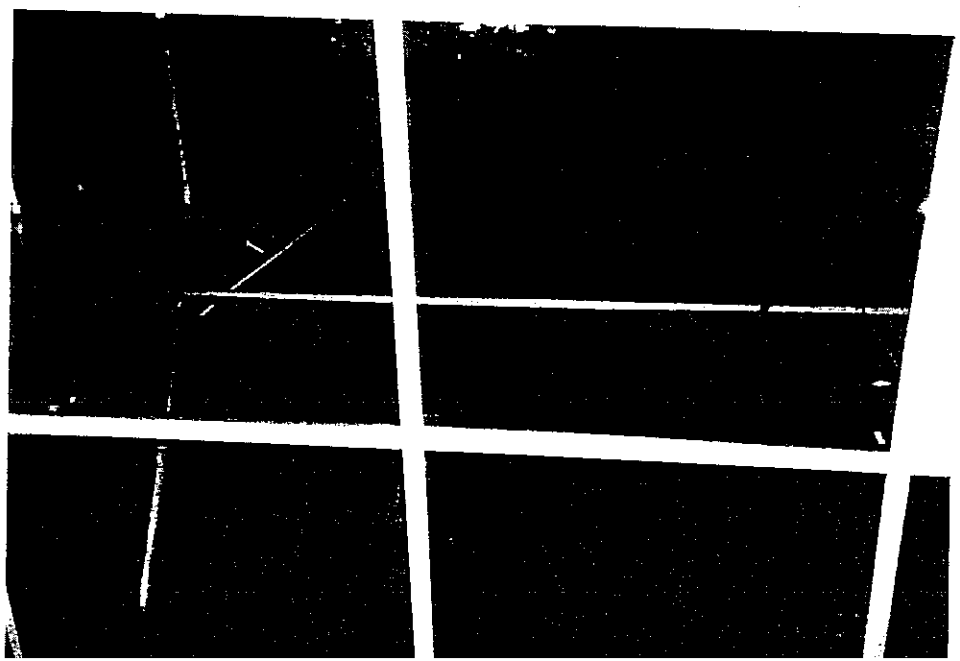


Photo 26. View of the ceiling, mechanical ducts and light fixture supports.



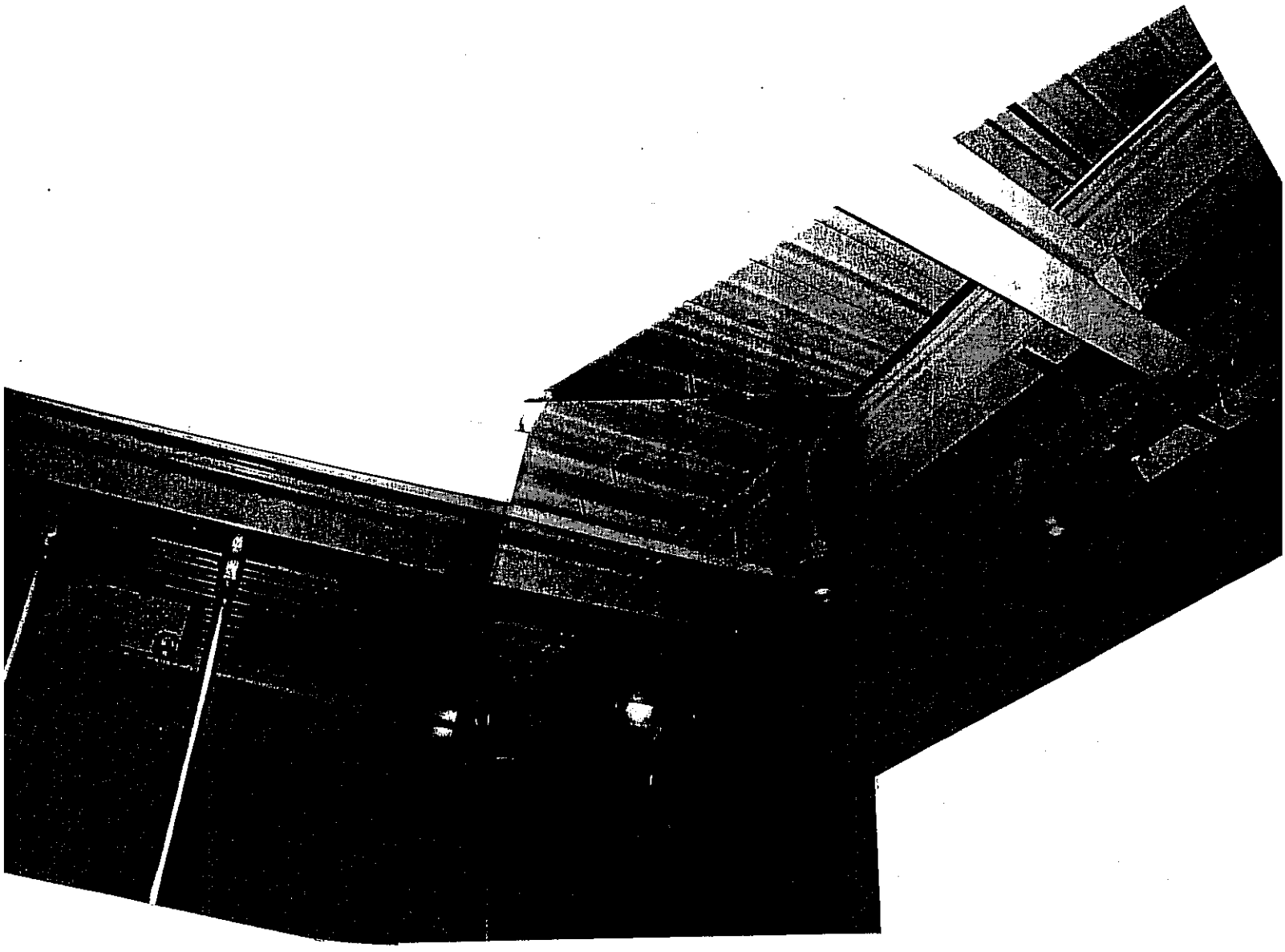


Photo 28. Underneath view of the steel deck roof. The roof consists of a built up roofing over a steel deck. The deck is tack welded to the roof joists. The roof offers limited diaphragm shear resistance to the building structure because of the fact that the tack welds do not qualify as a proper shear connection between the roof deck and the joists.

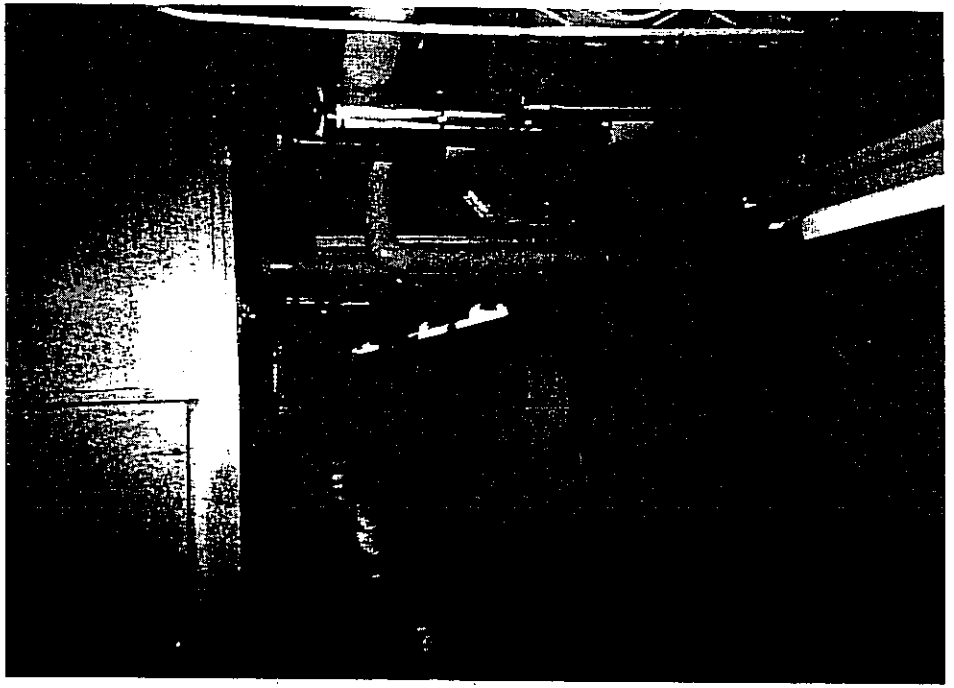
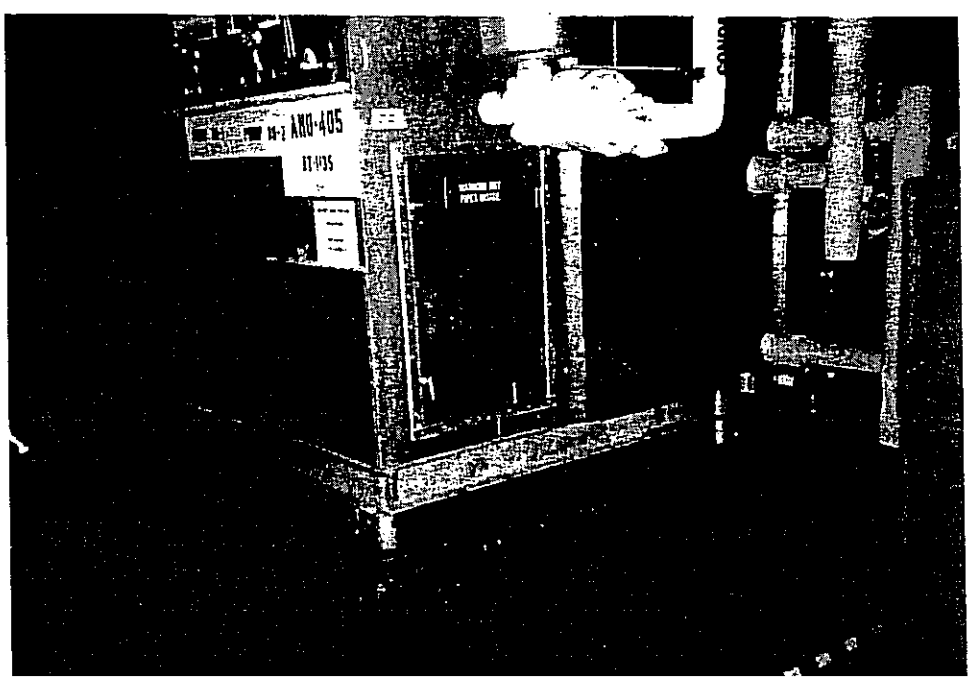


Photo 29. View of the Mezzanine floor. This floor hosts HVAC equipment as well as other electrical and mechanical equipment.



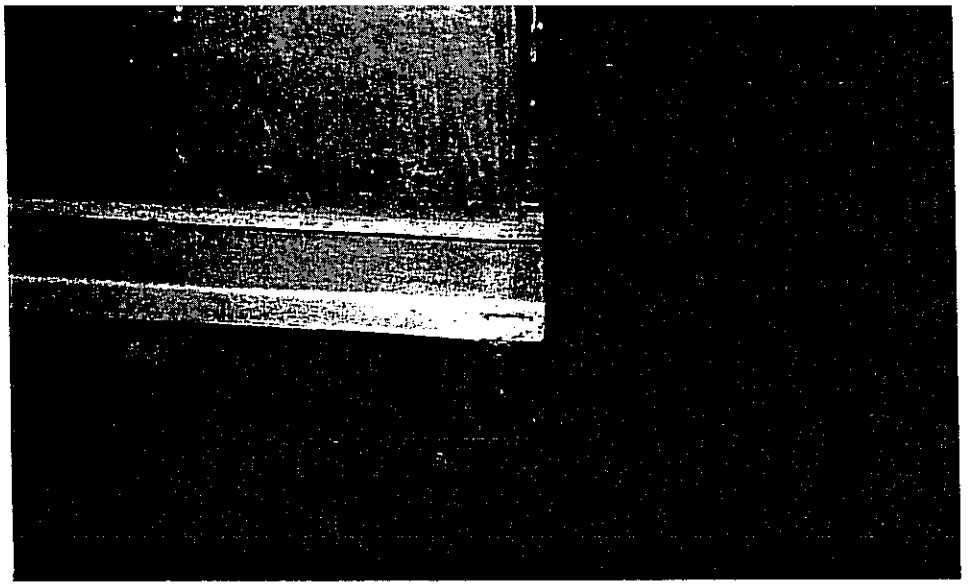


Photo 31. View of different type of anchorage for the mechanical equipment. This one is a rigid anchor type with no allowance for vibration. It connects the equipment rigidly to the foundation.

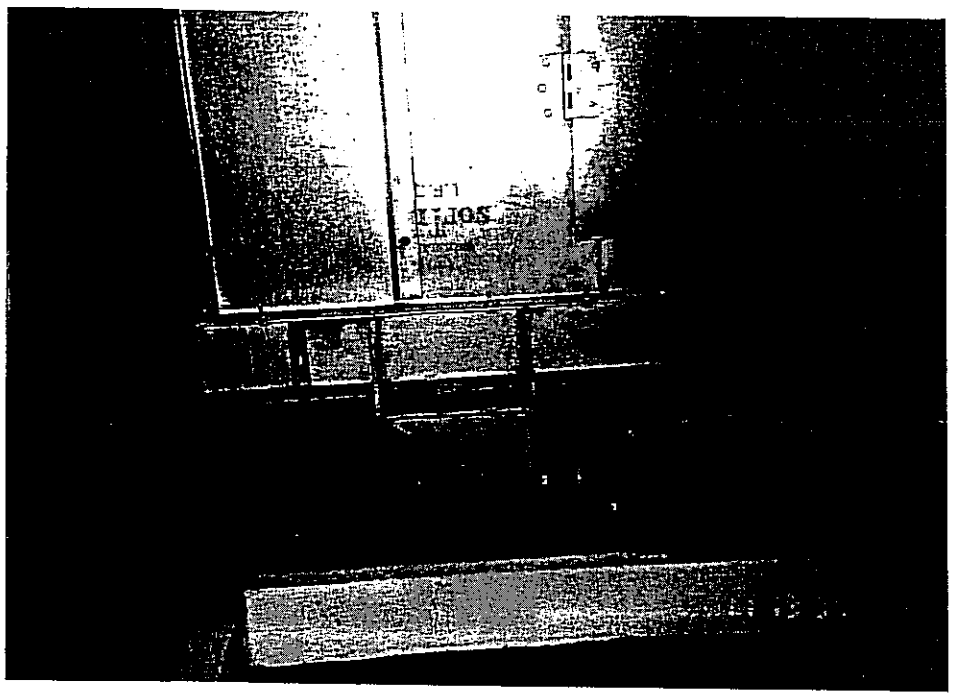


Photo 33. This other type of anchorage for the mechanical equipment provides vibration isolation and allows lateral restraint with a dampering effect. This anchor type is recommended to limit horizontal and vertical motion while absorbing stresses to minimize damage to equipment, piping connections or foundation.

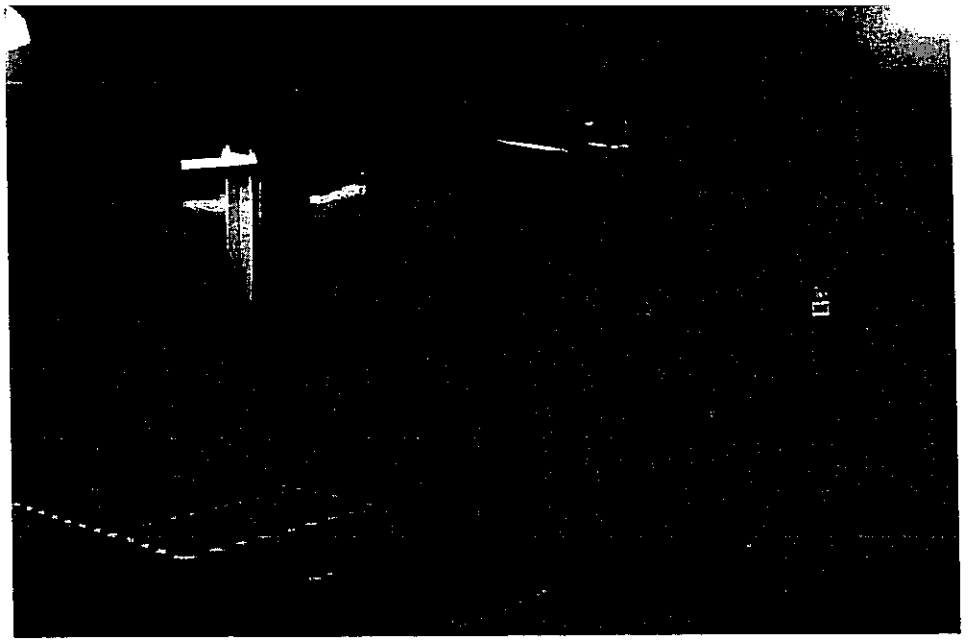
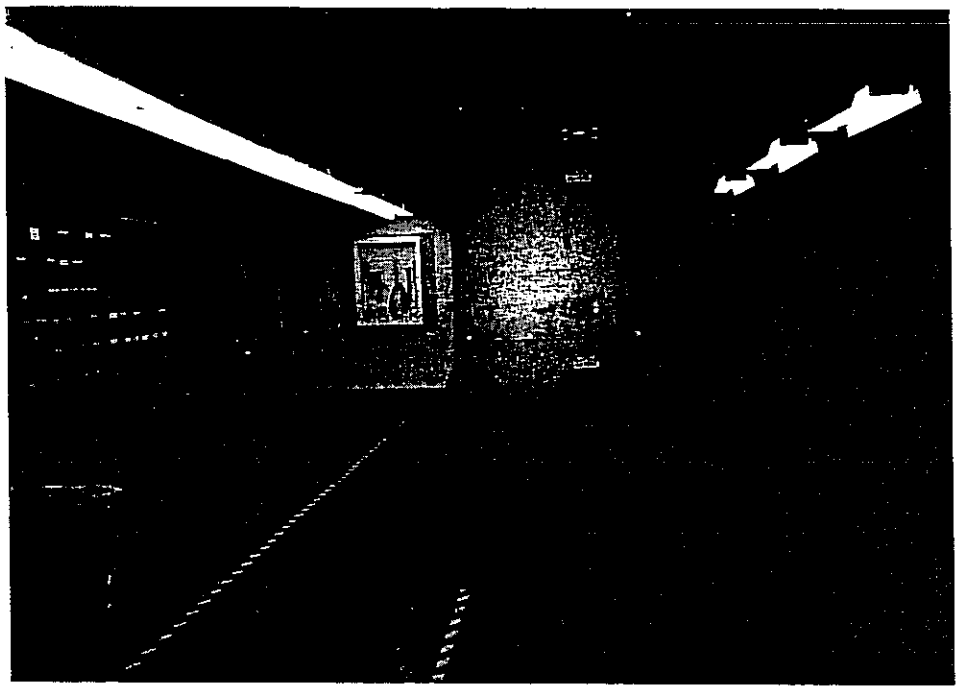


Photo 34. Electrical and mechanical equipment in the Mezzanine floor with no visible anchors. It is unknown whether the equipment is anchored and the anchors are concealed within the metal cabinetry.



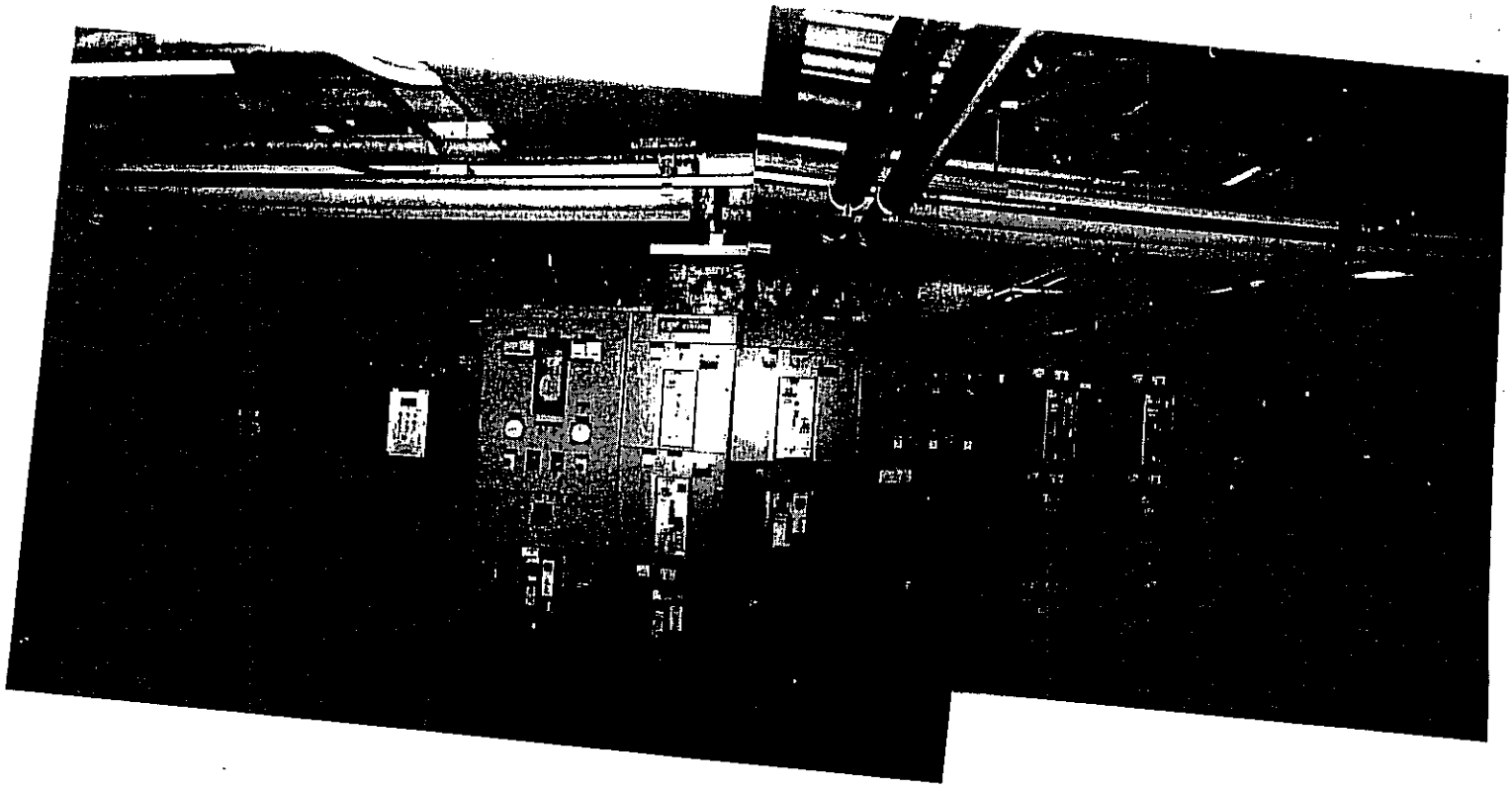
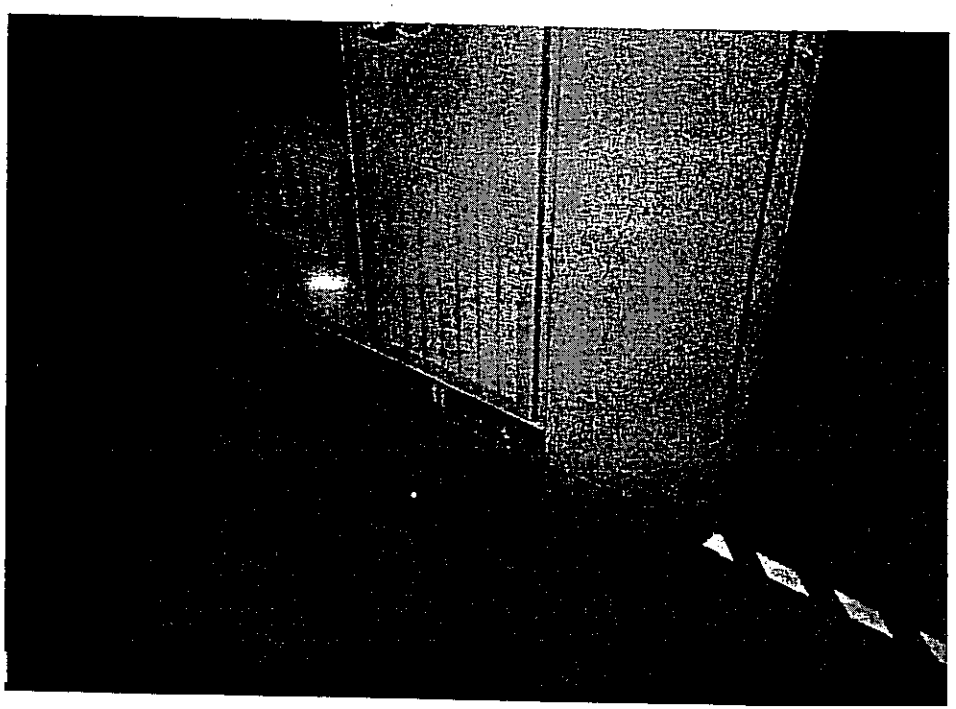


Photo 36. Electrical and mechanical equipment in the Mezzanine floor. It is unknown whether the equipment is anchored and the anchors are concealed within the metal cabinetry. The piping and conduits above are properly attached.

Photo 37. More equipment and furniture in the Mezzanine floor with rigid anchors directly attached to the floor. There is no pad under the equipment. The floor shows minor cracking as signs of distress caused by the anchors.



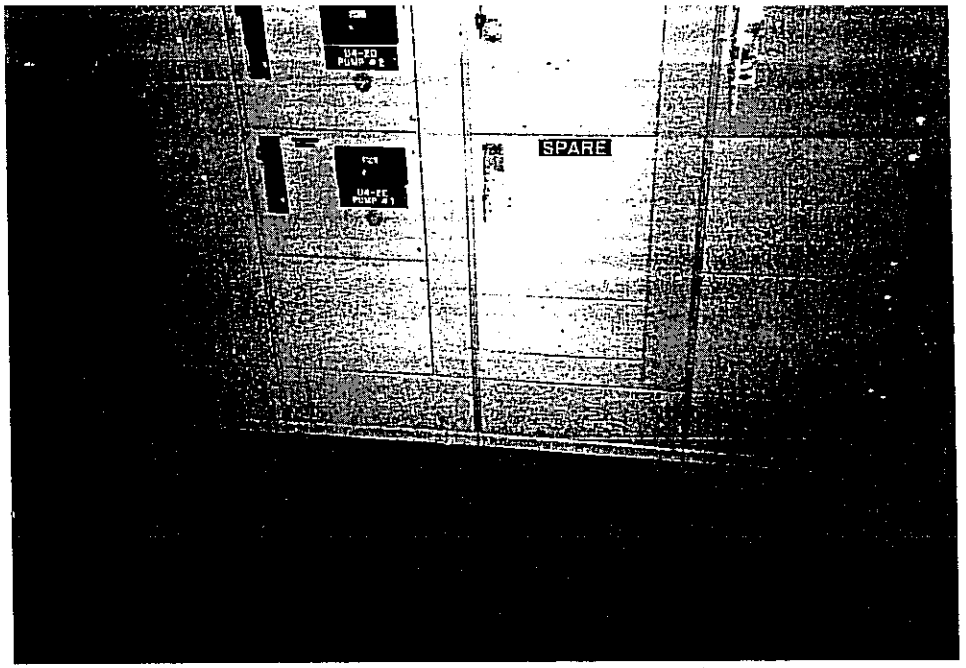
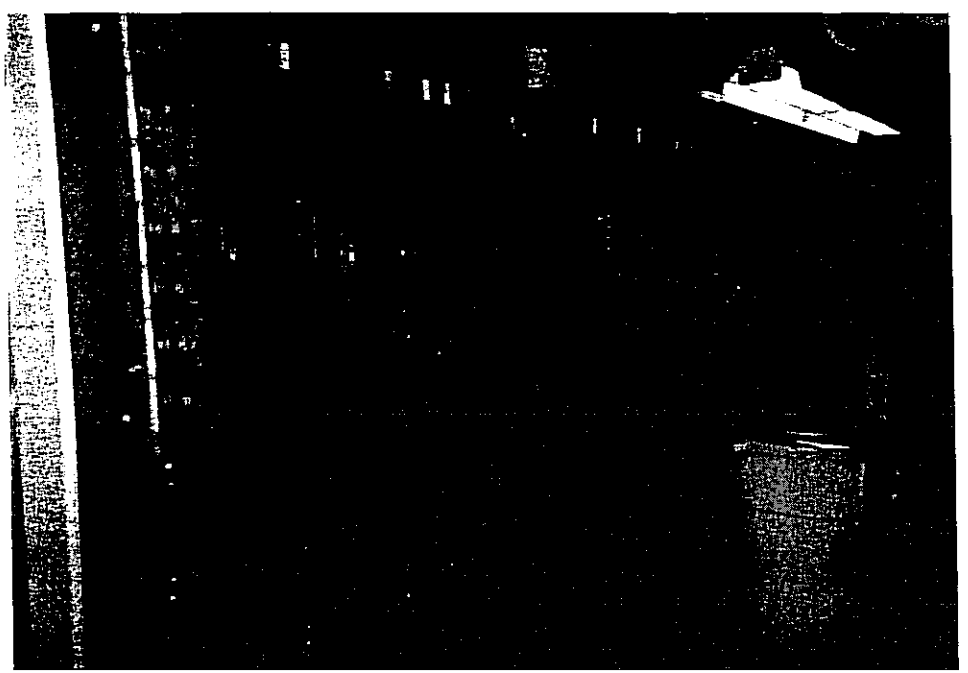


Photo 39. More equipment in the Mezzanine floor. It is unknown whether the equipment is anchored and the anchors are concealed within the metal cabinetry.



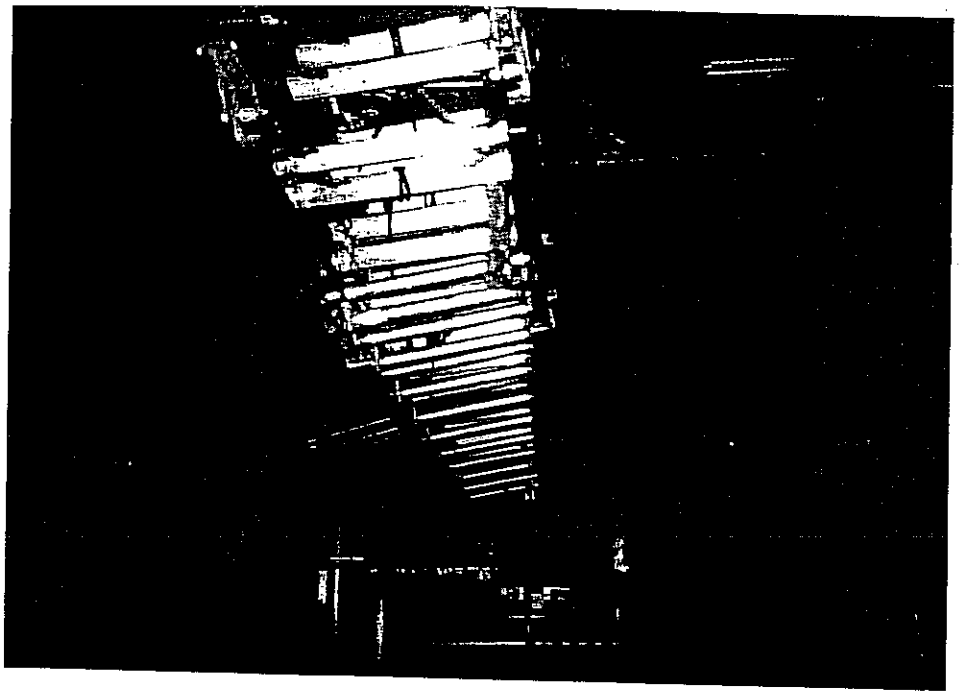
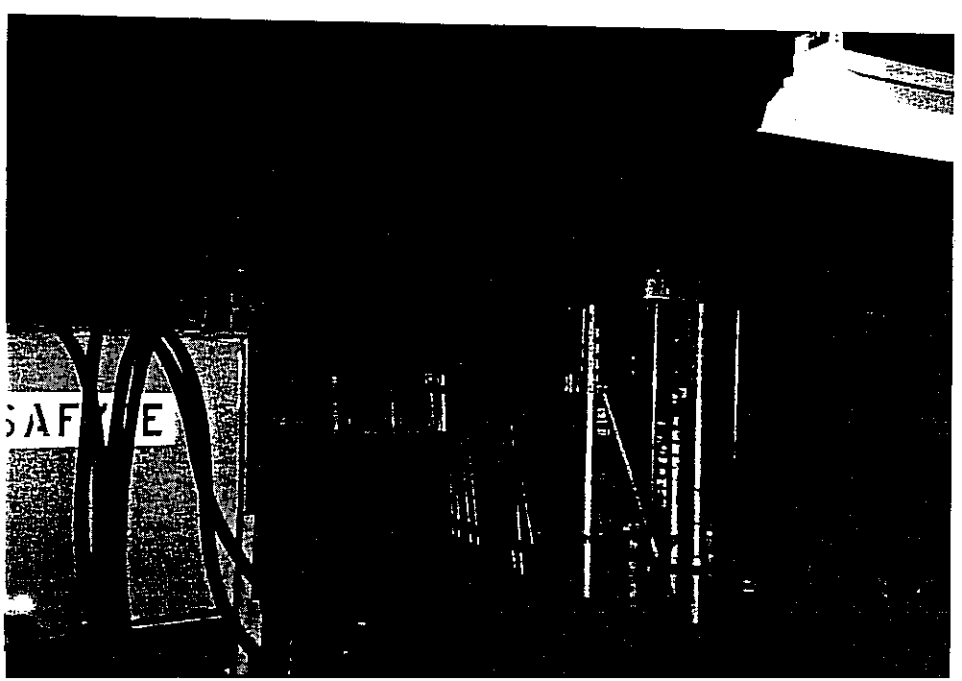


Photo 41. Ladders are hung from ceiling along pathways in the Mezzanine floor. They should be relocated against walls, away from pathways or escape exists, and properly secured.



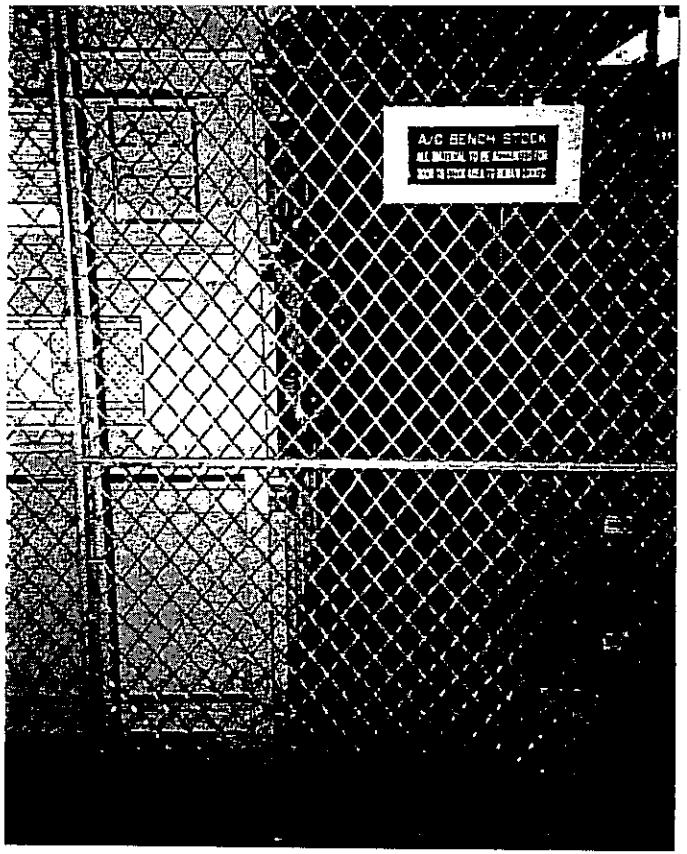
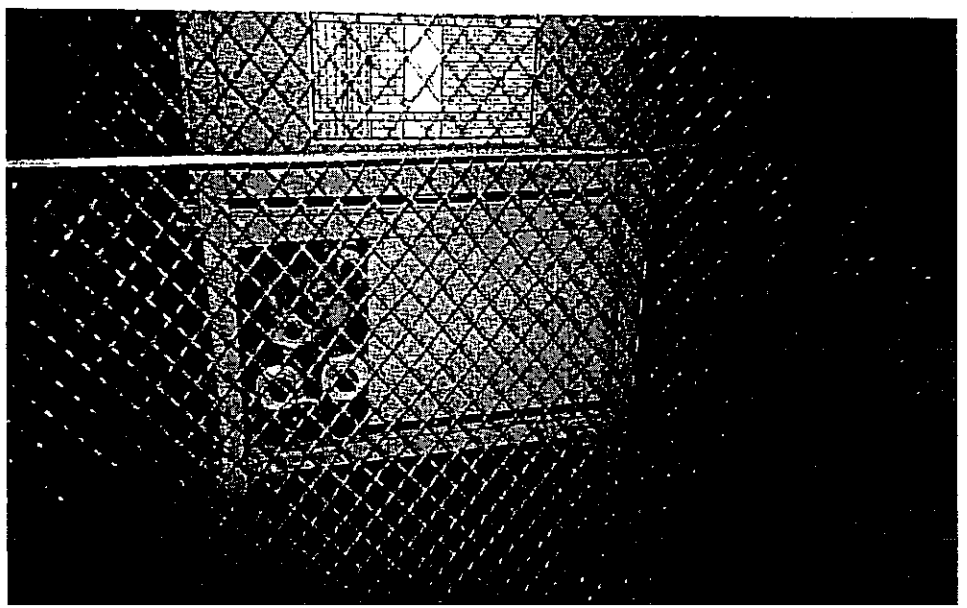


Photo 43. Designated equipment storage areas are fenced with chain-link fences properly anchored at the bottom. Anchoring of the top is recommended.



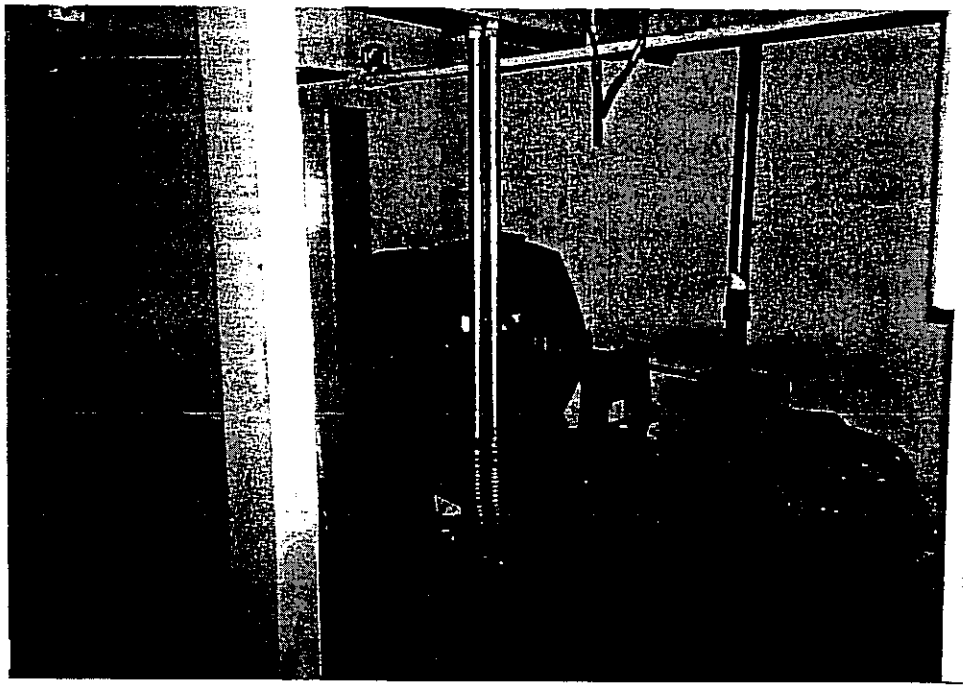
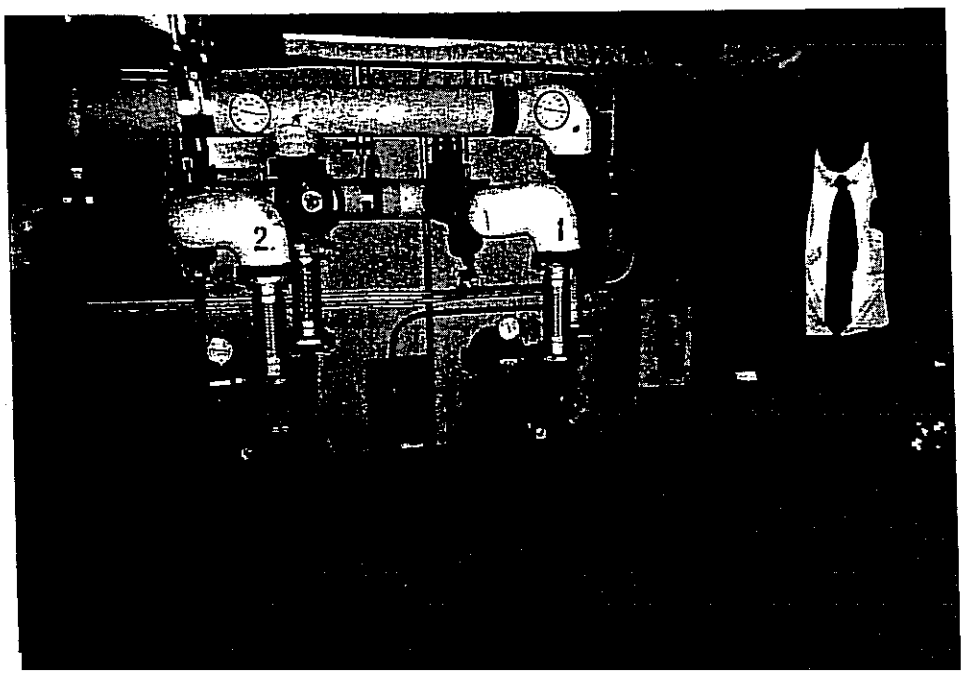


Photo 45. Elevator pumps and motors at elevator equipment room in the fourth floor are properly anchored.



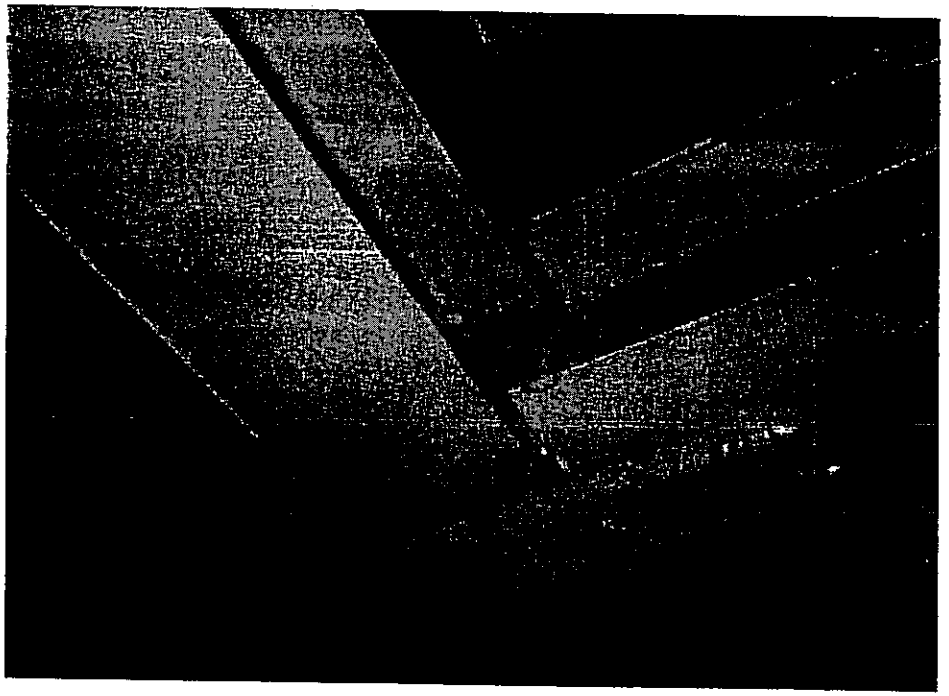
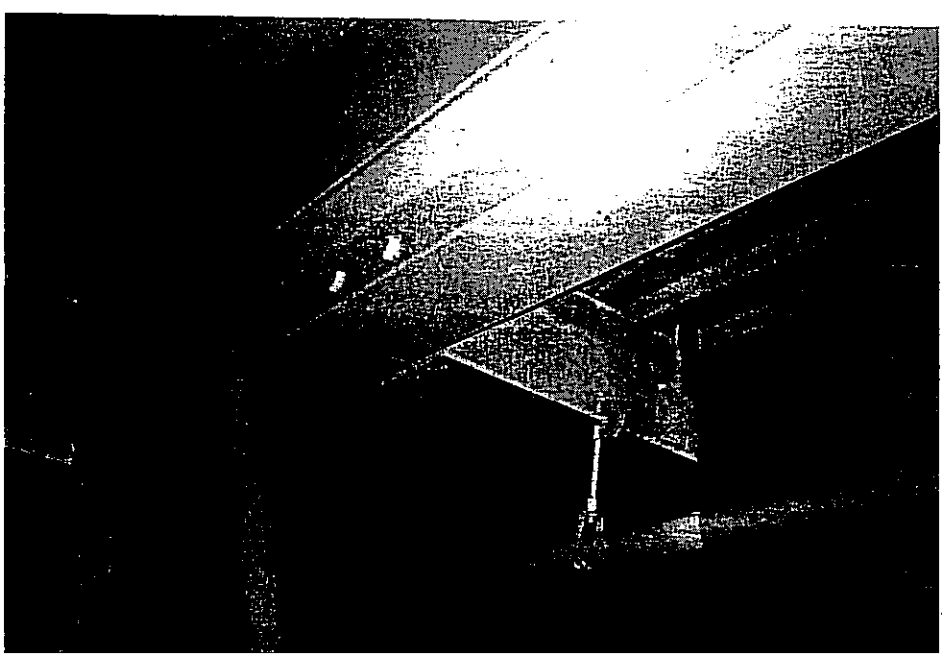


Photo 47. Some pipe crossing through walls do not have flexible joints or sleeves with tolerance for movement. Fire blocking is appropriate but tolerance for movement should be included.



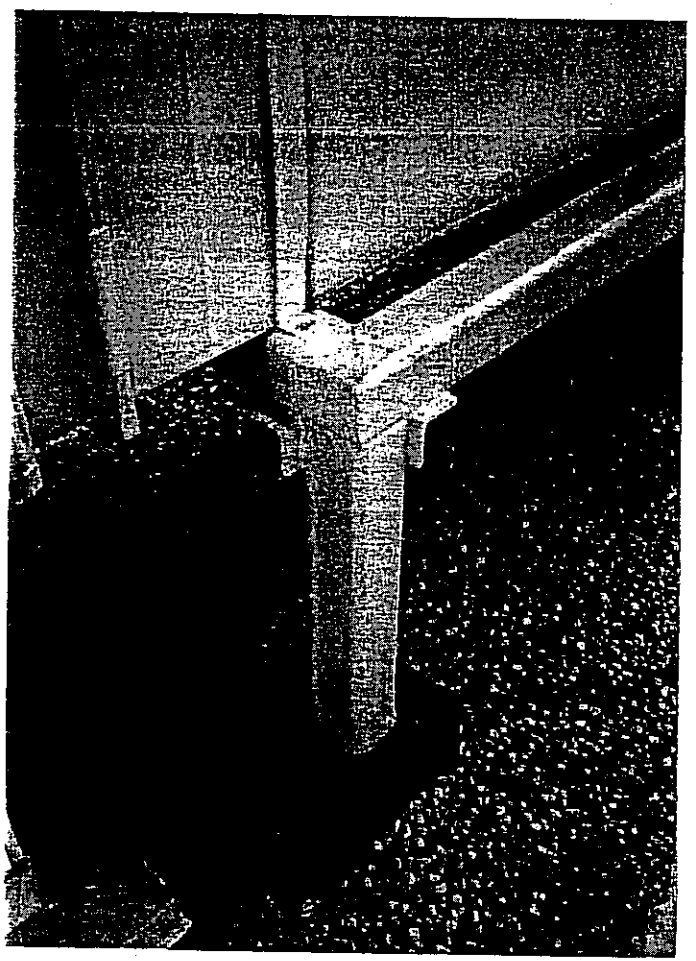


Photo 49. Some equipment supports at the roof level are rigidly anchored to the roof structure. Lateral bracing in both directions is recommended for legs supporting equipment over 18 inches above floor level.

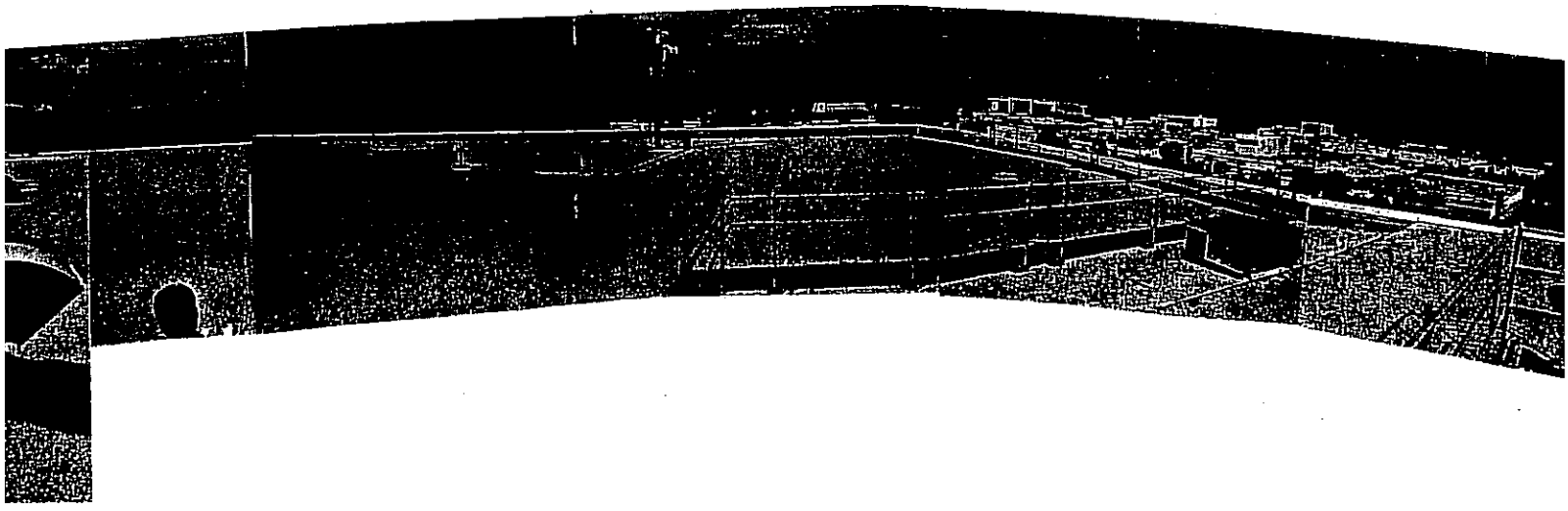


Photo 50. Miscellaneous equipment and antennas on the roof need to be secured more properly. Some redundant supports or anchorage are recommended.

DATA SUMMARY SHEET

BUILDING DATA

Year built: 1967 Year(s) remodelled: _____
Date of Evaluation: NOV-97
Area, (sq. ft.) 170,000 Length 258' Width 143' Photo Roll No. 1

CONSTRUCTION DATA

Rooframing: BUILT-UP ROOFING OVER STEEL DECK, OVER STL JOISTS.
Intermediate floor framing: CONC LAYER OVER STEEL DECK
Ground floor: CONC SLAB Basement: N/A
Exterior walls: PRECAST PANELS Openings: DOORS @ GROUND LEVEL
Columns: STEEL FRAME Foundations: CONC. PILES
General condition of structure: GOOD CONDITION
Evidence of settling: NONE

LATERAL FORCE RESISTING SYSTEM

	Transverse	Longitudinal
Model building type:	4 (Steel Braced Frame)	4 (Steel Braced Frame)
Building period, T:		

Unreduced base shear,
$V = [(0.80A_v \times S)/(R \times T^{2/3})] \times (W)$ or $V = [2.12Aa/R] \times W$ = 0.17

Response Modification Coefficient, R: 5 5

EVALUATION DATA

A_a = 0.4 A_v = 0.4

Site soil profile type: S-2 Site soil coefficient, S = 1.2

REMARKS

Address the following evaluation statements, marking each either true (T) or false (F). Statements that are found to be true identify issues that are acceptable according to the criteria of this handbook; statements that are found to be false identify issues that need investigation. For guidance in the investigations, refer to the handbook section indicated in parentheses at the end of the statement.

CONDITION OF FOUNDATIONS

(T) F FOUNDATION PERFORMANCE: The structure does not show evidence of excessive foundation movement such as settlement or heave that would affect its integrity or strength. (Sec. 9.1.1)

(T) F DETERIORATION: There is no evidence that foundation elements have deteriorated due to corrosion, sulphate attack, material breakdown, or other reasons in a manner that would affect the integrity or strength of the structure. (Sec. 9.1.2)

CAPACITY OF FOUNDATIONS

(T) F OVERTURNING: The ratio of the effective horizontal dimension, at the foundation level of the seismic resisting system, to the building height (base/height) exceeds $1.4A_v$. (Sec. 9.2.1)

(T) F TIES BETWEEN FOUNDATION ELEMENTS: Foundation ties adequate for seismic forces exist where footings, piles, and piers are not restrained by beams, slabs, or competent soils or rock. (Sec. 9.2.2)

(T) F LATERAL FORCE ON DEEP FOUNDATIONS: Piles and piers are capable of transferring the lateral forces between the structure and the soil. (Sec. 9.2.3)

N/A T F POLE BUILDINGS: Pole foundations have adequate embedment. (Sec. 9.2.4)

N/A T F SLOPING SITES: The grade difference from one side of the building to another does not exceed one-half story. (Sec. 9.2.5)

GEOLOGIC SITE HAZARDS

T (F) LIQUEFACTION: Liquefaction susceptible, saturated, loose granular soils that could jeopardize the building's seismic performance do not exist in the foundation soils at depths within 50 feet under the building. (Sec. 9.3.1) LIQUEFACTION POTENTIAL WITHIN 50' BELOW BUILDING EXISTS BUT FOUNDATION IS BASED ON A DEEP-PILE SYSTEM.

(T) F SLOPE FAILURE: The building site is sufficiently remote from potential earthquake

Address the following evaluation statements, marking each either true (T) or false (F). Statements that are found to be true identify issues that are acceptable according to the criteria of this handbook; statements that are found to be false identify issues that need investigation. For guidance in the investigation, refer to the handbook section indicated in parentheses after the headings.

PARTITIONS (Sec. 10.5.1)

(T) F In areas of high seismicity (A_v greater than or equal to 0.2), there are no unbraced unreinforced masonry or hollow clay tile partitions.

T (F) Partitions and fixed glass are detailed to accommodate the expected interstory drift.

T (F) Partitions at structural separations have seismic or control joints.

T (F) The tops of partitions that only extend to the ceiling line have lateral bracing.

CEILING SYSTEMS (Sec. 10.5.2)

T (F) Suspended ceilings and any ceiling-supported lighting or mechanical fixtures are adequately braced. HANGING FROM WIRES ONLY, NO LATERAL OR COMPRESSION MEMBERS.

(T) F Ceilings are not suspended plaster or gypsum board. (IN A FEW AREAS ONLY)

T (F) Lay-in tiles are not used for ceiling panels. – CEILINGS ARE MADE OF LAY-IN TILES

T (F) The edges of ceilings are separated from structural walls.

(T) F The ceiling system does not extend continuously across any seismic joints. – DIFFICULT TO VERIFY AT EVERY PLACE.

(T) F The ceiling system is not required to laterally support the top of gypsum board, masonry, or hollow clay tile partitions.

LIGHT FIXTURES (Sec. 10.5.3)

T (F) All light fixtures are supported and braced independently of the ceiling suspension system. – NOT TRUE AS SEEN ON 3RD FLOOR

T (F) Multiple length fluorescent fixtures have bracing or secondary support throughout their length. – NOT TRUE IN 3RD FLOOR & MEZZANINE.

T (F) The diffusers on fluorescent light fixtures are supplied with safety devices or some form of positive attachment. – SLB LAMPS DO NOT HAVE SAFETY DEVICES

T F Emergency lighting equipment and signs are anchored and/or braced to resist vertical and horizontal earthquake loads.

CLADDING, GLAZING, AND VENEER (Sec. 10.5.4)

T F All exterior cladding and veneer courses are properly anchored to the exterior wall framing for in-plane and out-of-plane lateral forces.

T F Masonry veneer is connected to the back-up with corrosion-resistant ties; in areas of high seismicity (A_v greater than or equal to 0.2), tie spacing is at 24 inches on center maximum with at least one tie for every 2-2/3 square feet. ← NO MASONRY VENEER EXISTS !

T F For moment frame buildings of steel or concrete, panels are isolated from the structural frame to absorb predicted interstory drift without collapse. N/A

T F Where multistory panels are attached at each floor level, the panels and connections can accommodate interstory drift.

T F Where bearing connections are required, there are at least two bearing connections for each wall panel.

T F Where inserts are used in concrete connections, the inserts are properly anchored to reinforcing steel.

T F There are at least four connections for each wall panel capable of resisting out-of-plane forces.

T F Welded connections appear to be capable of yielding in the base metal before fracturing the welds or inserts.

T F All eccentricities in connections are accounted for.

T F Connections appear to be installed properly.

T F No connection element is severely deteriorated or corroded. — SOME ARE SLIGHTLY RUSTED. RECOMMEND TO BE PAINTED.

T F There is no cracking in the panel materials indicative of substantial structural distress.

T F Glazing is isolated to accept predicted interstory drift without shattering. — NOT IN SOME PLACES

T F There is no substantial damage to exterior cladding due to water leakage.

T F There is no substantial damage to exterior cladding due to temperature movements.

Metal Stud Back-Up Systems, General (Sec. 10.5.4.1)

T F Additional steel studs frame window and door openings.

Masonry Veneer with Stud Back-Up (Sec. 10.5.4.2) — N/A THERE IS NO MASONRY VENEER.

T F Masonry veneer more than 30 feet above the ground is supported by shelf angles or other elements at each floor level.

T F Masonry veneer is adequately anchored to the back-up at locations of through-wall flashing.

T F Masonry veneer is connected to the back-up with corrosion-resistant ties; in areas of high seismicity (A_v greater than or equal to 0.2), tie spacing is at 24 inches on center maximum and with at least one tie for every 2-2/3 square feet.

T F Weep holes are present and base flashing is installed.

T F For veneer with anchorage to back-up that does not meet the requirements for anchorage identified above, the computed tensile stresses in the veneer do not exceed the allowable for unreinforced brick as defined by ACI 530.

T F Mortar joints in the masonry veneer are well filled, and material cannot be easily scraped out from the joints.

Masonry Veneer with Concrete Block Back-Up (Sec. 10.5.4.3) — N/A

T F Masonry veneer more than 30 feet above the ground is supported by shelf angles or other elements at each floor level.

T F Masonry veneer is adequately anchored to the back-up at locations of through-wall flashing.

T F Masonry veneer is connected to the back-up with corrosion-resistant ties; in areas of high seismicity (A_v greater than or equal to 0.2), tie spacing is at 24 inches on center maximum and with at least one tie for every 2-2/3 square feet.

T F In areas of high seismicity (A_v greater than or equal to 0.2), the concrete block back-up qualifies as reinforced masonry.

T F The concrete block back-up is positively anchored to the structural frame at 4 feet maximum intervals along the floors and roofs.

T F Mortar joints in brick and block wythes are well filled, and material cannot be easily scraped from the joints.

Thin Stone Veneer Panels (Sec. 10.5.4.4) — N/A

T F Stone anchorages are adequate for computed loads.

T F There are no visible cracks or weak veins in the stone.

T F There is no visible deterioration of screws or wood at panel attachment points.

PARAPETS, CORNICES, ORNAMENTATION, AND APPENDAGES (Sec. 10.5.5)

(T) F There are no laterally unsupported unreinforced masonry parapets or cornices above the highest anchorage level with height/thickness ratios greater than 1.5 (2.5 if A_v is less than 0.3).

(T) F Concrete parapets with height/thickness ratios greater than 1.5 (2.5 if A_v is less than 0.3) have vertical reinforcement.

(T) F Cornices, parapets, signs, and other appendages that extend above the highest anchorage level or cantilever from exterior wall faces and other exterior wall ornamentation are reinforced and well anchored to the structural system. – EXCEPT FOR SOME ANTENNAS AT ROOF. 3FT HIGH PARAPET WITHOUT DIAG. BRACING.

CHIMNEYS (Sec. 10.5.6) — N/A THERE IS NO CHIMNEYS

T F No unreinforced masonry chimney extends above the roof surface more than twice the least dimension of the chimney.

T F Masonry chimneys are anchored to the floor and roof.

MEANS OF EGRESS (Sec. 10.5.7)

(T) F Walls around stairs, elevator enclosures, and corridors are not hollow clay tile or unreinforced masonry.

T (F) Stair enclosures do not contain any piping or equipment except as required for life safety. THERE ARE WATER LINES. SLAB SLIGHTLY CRACKED DUE TO DIAG. SHEAR.

(T) F Veneers, cornices, canopies, and other ornamentation above building exits are well anchored to the structural system.

T (F) Lay-in ceiling boards and tiles used in exits or corridors are secured with clips.

(T) F Canopies are anchored and braced to prevent collapse and blockage of building exits.

BUILDING CONTENTS AND FURNISHINGS (Sec. 10.5.8)

(T) F Tall, narrow (height/depth > 3) storage racks, bookcases, file cabinets, or similar heavy items are anchored to the floor slab or adjacent walls.

(T) F Tall file cabinets are anchored to the floor slab or an adjacent partition wall.

(T) F File cabinets arranged in groups are attached to one another to increase their stability.

(T) F Cabinet drawers have latches to keep them closed during shaking.

(T) F Computers and communications equipment are anchored to the floor slab and/or structural walls to resist overturning forces. — DIFFICULT TO VERIFY ANCHORAGES IN SOME PLACES.

(T) F Computer access floors are braced to resist lateral forces. — THERE ARE SOME LOOSE FLOOR TILES.

MECHANICAL AND ELECTRICAL EQUIPMENT (Sec. 10.5.9)

T (F) Equipment is adequately anchored to the structure or foundation. — IN MEZZANINE, THERE ARE HEAVY AIR HANDLING UNITS NOT PROPERLY ANCHORED

T (F) Equipment mounted on vibration isolators is equipped with restraints or snubbers to limit horizontal and vertical motion. — NOT ALWAYS. NO RESTRAINTS ON SOME EQUIPMENT

(T) F Life-safety evacuation mechanical and electrical equipment is properly mounted to continue operation after an earthquake. — SOME FIRE EXTINGUISHERS SITTING ON FLOORS AT STAIRCASES NEED TO BE STORED IN CABINETS OR ATTACHED TO WALLS.

(T) F No pieces of major mechanical equipment are suspended from the structure without seismic bracing. — SOME CONCERN FOR HEAVY PUMP AT ELEVATOR ROOM @ 4TH FLOOR

(T) F All electrical equipment is positively attached to the structural system.

(T) F All equipment supported on access floor systems either is directly attached to the structure or is fastened to a laterally braced floor system. DIFFICULT TO VERIFY EVERYWHERE.

PIPING (Sec. 10.5.10)

T (F) For fire suppression piping (e.g., sprinkler system piping including standpipes), risers are anchored and braced with flexible couplings to allow for building drift and floor movement due to building configuration or seismic separation.

T (F) Gas and oil piping is anchored and braced. — ANCHORED BUT NOT BRACED LATERALLY.

(T) F Shutoff devices are provided at building utility interfaces to shut off the flow of gas, high temperature energy, etc., in the event of earthquake-induced failure.

T (F) No pipes cross seismic joints without a flexible connector.

(T) F No pipes are supported by other pipes.

T (F) No pipe sleeve wall opening has a diameter of less than about 2 inches larger than the pipe. SOME PIPING HAS NO SLEEVES.

T (F) There are no unrestrained one-side C-clamps that support major piping.

DUCTS (Sec. 10.5.11)

(T) F Stair pressurization and smoke control ducts are braced to resist horizontal and vertical

HAZARDOUS MATERIALS (Sec. 10.5.12)

T (F) Compressed gas cylinders are restrained against motion. — NEED BETTER RESTRAINT IN MEZZANINE ROOM.

T F Laboratory chemicals stored in breakable containers are restrained from falling by latched doors, shelf lips, wires, or other methods. N/A

(T) F Piping containing hazardous materials is provided with shut-off valves or other devices to prevent major spills or leaks.

ELEVATORS (Sec. 10.5.13)

(T) F All elements of the elevator support system are anchored and configured to resist lateral seismic forces.

T F With the elevator car and/or counterweight located in its most adverse position in relation to the guide rails and support brackets, the horizontal deflection will not exceed 1/2 inch between supports and horizontal deflections of the brackets will not exceed 1/4 inch.

T F Snag points created by rail brackets, fish plates, etc., are equipped with guards to prevent the snagging of relevant moving elements.

T F The clearance between the car and counterweight assembly and between the counterweight assembly and the hoistway enclosure or separator beam is not less than 2 inches. VERY DIFFICULT TO CHECK!

T F Cable retainer guards on sheaves and drums are installed to inhibit the displacement of cables.

T F A retainer plate is provided at the top and bottom of both car and counterweight.

T F The clearance between the faces of the rail and the retainer plate does not exceed 3/16 inch.

T F The maximum spacing of the brackets that tie the counterweight rail to the building structure does not exceed 16 feet.

T F An intermediate spreader bracket is provided for tie brackets spaced greater than 10 feet and two intermediate spreader brackets are provided for tie brackets spaced greater than 14 feet.

T (F) The elevator motor is restrained by the vibration isolator system. — NOT TRUE AS SEEN ON 4TH FLOOR ELEVATOR EQUIPMENT ROOM.

(T) F The elevator control panel is anchored at top and bottom.

These buildings are similar to Type 3 buildings except that the vertical components of the lateral-force-resisting system are braced frames rather than moment frames.

Address the following evaluation statements, marking each either true (T) or false (F). Statements that are found to be true identify issues that are acceptable according to the criteria of this handbook; statements that are found to be false identify issues that need investigation. For guidance in the investigation, refer to the handbook section indicated in parentheses at the end of the statement.

Be advised that the numerical indices preceded by an asterisk (*) in these statements are based on high seismicity (A_v = 0.4). Adjustments are reasonable for lower seismicity. The appropriate adjustment is not necessarily a direct ratio of seismicity.

BUILDING SYSTEMS

(T) F LOAD PATH: The structure contains a complete load path for seismic force effects from any horizontal direction that serves to transfer the inertial forces from the mass to the foundation (NOTE: Write a brief description of this linkage for each principal direction.) (Sec. 3.1) E W and N S perimeter frames have diagonal braces

(T) F REDUNDANCY: The structure will remain laterally stable after the failure of any single element. (Sec. 3.2)

(T) F WEAK STORY: Visual observation or a Quick Check indicates that there are no significant strength discontinuities in any of the vertical elements in the lateral-force-resisting system; the story strength at any story is not less than 80 percent of the strength of the story above. (Sec. 3.3.1)

(T) F SOFT STORY: Visual observation or a Quick Check indicates that there are no significant stiffness discontinuities in any of the vertical elements in the lateral-force-resisting system; the lateral stiffness of a story is not less than 70 percent of that in the story above or less than 80 percent of the average stiffness of the three stories above. (Sec. 3.3.2)

(T) F GEOMETRY: There are no significant geometrical irregularities; there are no setbacks (i.e., no changes in horizontal dimension of the lateral-force-resisting system of more than 30 percent in a story relative to the adjacent stories). (Sec. 3.3.3)

(T) F MASS: There are no significant mass irregularities; there is no change of effective mass of more than 50 percent from one story to the next, excluding light roofs. (Sec. 3.3.4)

(T) F VERTICAL DISCONTINUITY: All frames are continuous to the foundation. (Sec. 3.3.5)

distance between the story center of rigidity and the story center of mass is greater than 20 percent of the width of the structure in either major plan dimension. (Sec. 3.3.6)

(T) F DETERIORATION OF STEEL: There is no significant visible rusting, corrosion, or other deterioration in any of the steel elements in the vertical or lateral-force-resisting systems. (Sec. 3.5.3)

BRACED FRAMES

T (F) STRESS CHECK: The building satisfies the Quick Check of the stress in the diagonal bracing. (Sec. 6.1.1)

(T) F STIFFNESS OF DIAGONALS: All diagonal elements required to carry compression have Kl/r ratios less than 120. (Sec. 6.1.2)

(T) F TENSION-ONLY BRACES: Tension-only braces are not used as the primary diagonal bracing elements in structures over two stories in height. (Sec. 6.1.3)

(T) F CHEVRON BRACING: The bracing system does not include chevron, V-, or K-braced bays. (Sec. 6.1.4)

(T) F CONCENTRIC JOINTS: All the diagonal braces frame into the beam-column joints concentrically. (Sec. 6.1.5)

(T) F CONNECTION STRENGTH: All the brace connections are able to develop the yield capacity of the diagonals. (Sec. 6.1.6)

(T) F COLUMN SPLICES: All column splice details of the braced frames can develop the column yield capacity. (Sec. 6.1.7)

DIAPHRAGMS

N/A T F PLAN IRREGULARITIES: There is significant tensile capacity at re-entrant corners or other locations of plan irregularities. (Sec. 7.1.1)

(T) F REINFORCING AT OPENINGS: There is reinforcing around all diaphragm openings larger than 50 percent of the building width in either major plan dimension. (Sec. 7.1.3)

T F OPENINGS AT BRACED FRAMES: Diaphragm openings immediately adjacent to the braced frames extend less than 25 percent of the length of the bracing. (Sec. 7.1.5)

CONNECTIONS

(T) F TRANSFER TO STEEL FRAMES: The method used to transfer diaphragm shears to the steel frames is approved for use under lateral loads. (Sec. 8.3.2)

STRUCTURAL CALCULATIONS

original design dec, 1965 by
C F Braun & Co;

- UBC for seismic, no snow load
- AISC
- ACI
- Airforce manual 88-3
- Foundation Investigation: Hardings.
- SFF Design Criteria by Aerospace Corp.

Materials:

steel sections A 36

" Plates A 373

Bolts A 307 & A 325, threads in shear plane

Concrete 3000 psi

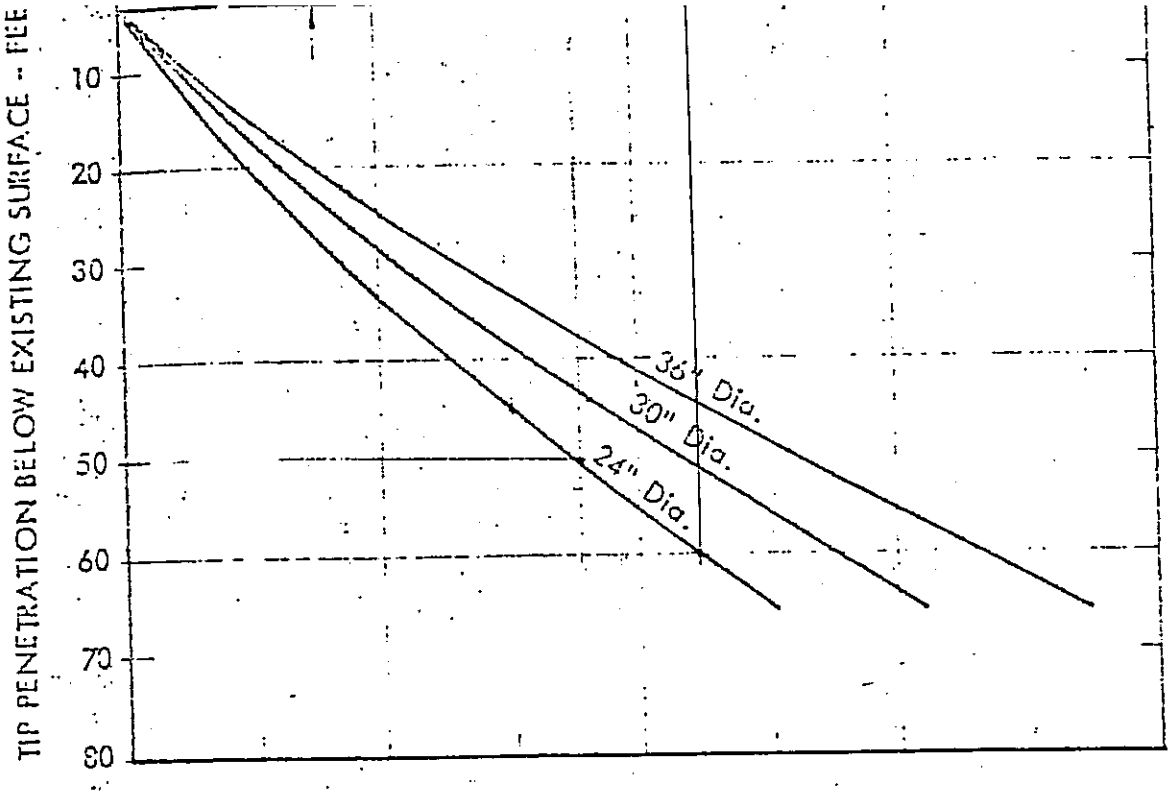
Roofing	6 psf
Roof insulation	3 psf
Floors (4" composite)	44 psf
Equipment & partit	20 psf
fixed partitions	16 plf
computer floor	12 psf
cables	4.5 psf

Ceiling

ceiling	1.5
ducts	1.0
sprinkler	1.0
lights etc	—
	3.5 psf

Exterior wall panels 38.5 psf

2nd floor Hvy 20 psf.



DRILLED CAST-IN-PLACE CONCRETE PILES

NOTES:

1. The indicated capacities are for dead plus live loads and may be increased by one-half for total design loads including seismic forces.

2. The indicated capacities are based on the strength of the supporting soil; the structural capacity of the pile material may impose further limitations.

3. For uplift capacities use one-half of the indicated downward capacity (neglecting the one-half increase).

4. Piles installed in groups shall be spaced no closer than three diameters center to center.

5. The lengths shown are for average soil conditions as encountered in Boring 6 and in the test piles.

- Drilled cast in place 24" ø to 36" ø
  45 ft to 60 ft lng.
  see capacity chart
- spread ftgs allowable bearing 3.0 Ksf
  (not used)

Building Description:

The building is a braced steel frame structure as described in section 2 of the report.

The roof is metal decking.

- Roof 145 x 200 x 25 psf = 931
  Wall Bracing
  Elevator, Mech rooms = 77
  Interior cols = 21
  Ext steel & concrete = 558
  1,587 K

- 4th Floor 37 228 x 98 psf = 3648
  raised floor = 117
  interior cols = 54
  ext steel & P.C. walls = 948
  4,747 K

- 3th Floor = 3648
  raised floor = 117
  interior columns = 69
  ext. steel & P-C walls = 695

ext. columns	= 62
new office area (37 228 - 15795) 80 psf	= 1,719
ext steel of p.c. walls	= 619 K
	3518 K

- 2nd Floor

37,228 sf x 98 psf	= 3648
conc. raised flr	117
interior columns	84
ext steel of p.c. walls	841
	4690 K

Total Building Weight 19,071 K

per section 2.4.3.2

$T = 0.10 * N$ (N = number of stories)

$= 0.4$ sec

check using FEMA 178 equation 2-6 4

$$T_a = \frac{0.05\, h_n}{\sqrt{L}}$$

$$= \frac{(.05)(100)}{\sqrt{143}}$$

$T_a = 0.411$ sec ✓

use $T = 0.4$ sec

V = 0.17 W

from page 5 W = 19,071 K

To approximate the effect of torsion using a 5% increase for accidental torsion

$$V = 0.17 \times 1.05 \times 19,071$$

$$V = 3,404 \text{ K}$$

Checking the braces in the 1st floor,
10 braces take the total base shear

∴ approximate shear per brace = 340 K

Brace capacity:

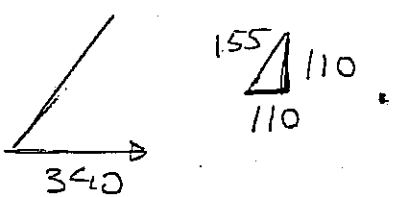
brace section = 2(4 x 4 x 5/16) Typ angles

A = 10 in²

for A 36 steel

C = 10 x .67 x 36

C = 241 K ✓



Brace demand

$Q = 340^{K}\left(\frac{155}{110}\right)$

Q = 479K ✓

OK

Pile capacity (neglect small contribution from tributary dead load)

$$\left\{\begin{array}{l} = 130 \text{ Tons} = 260^{K} \\ = 90 \text{ Tons} = 180^{K} \end{array}\right\} \quad \begin{array}{l} 36''\phi \\ 24''\phi \end{array}$$

increase by 50% for seismic load compression

$$C = (1.5)(180) \quad \text{or} \quad (1.5)(260)$$

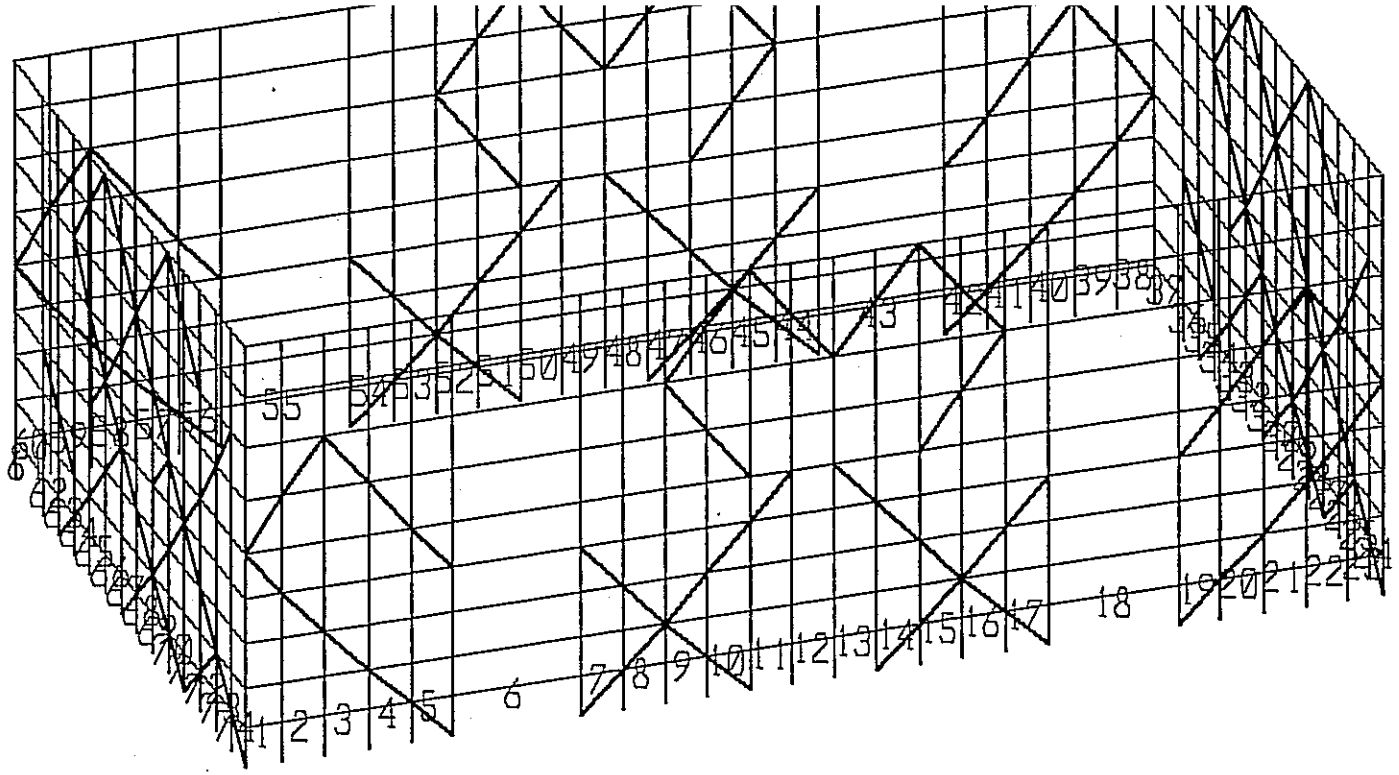
$$C = 270^{K} \quad \text{for } 24''\phi \qquad C = 390^{K} \quad \text{for } 36''\phi$$

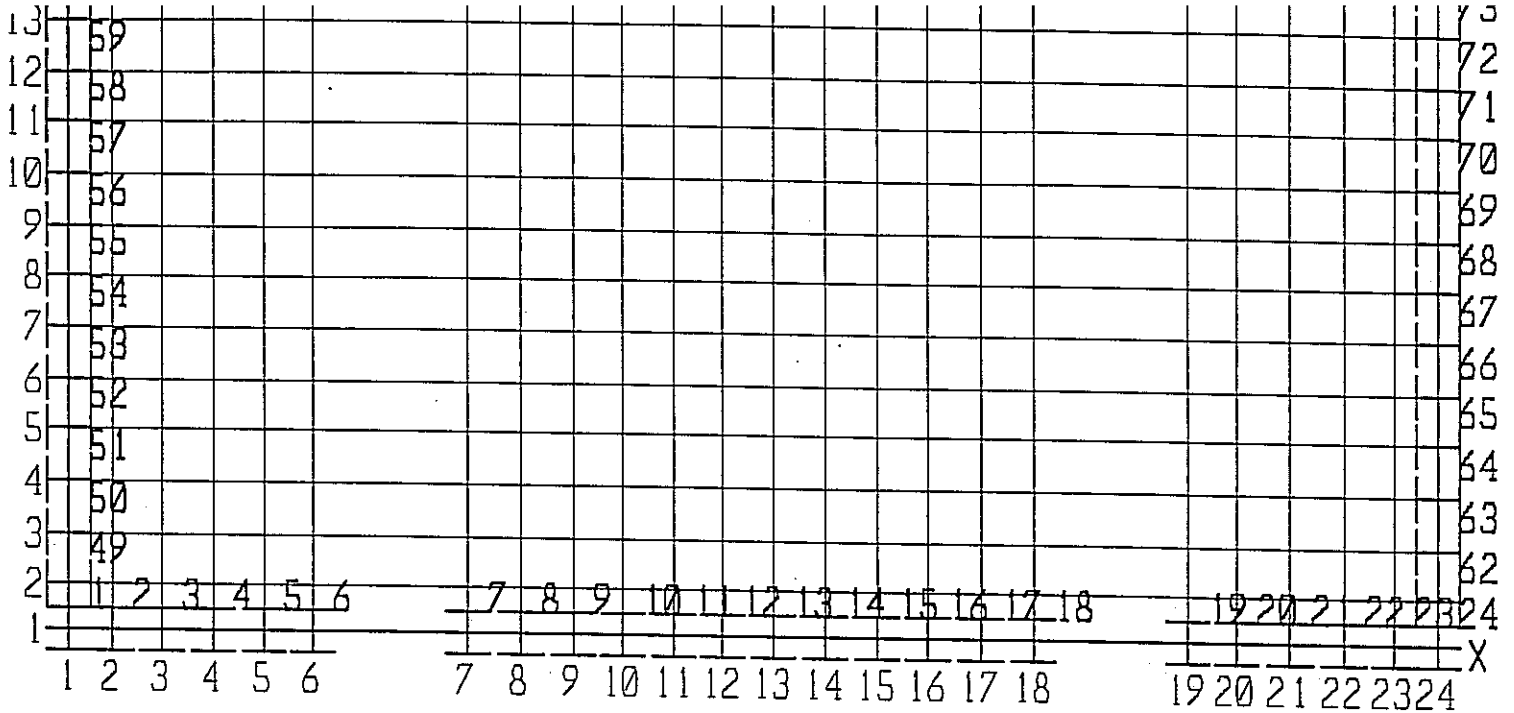
$Q/C = 1.26$ in compression for $24''\phi$

$= 0.87$ " for $36''\phi$

in tension (uplift) neglect 50% increase and reduce by 50%

$Q/C = 3.77$ in uplift for $24''\phi$

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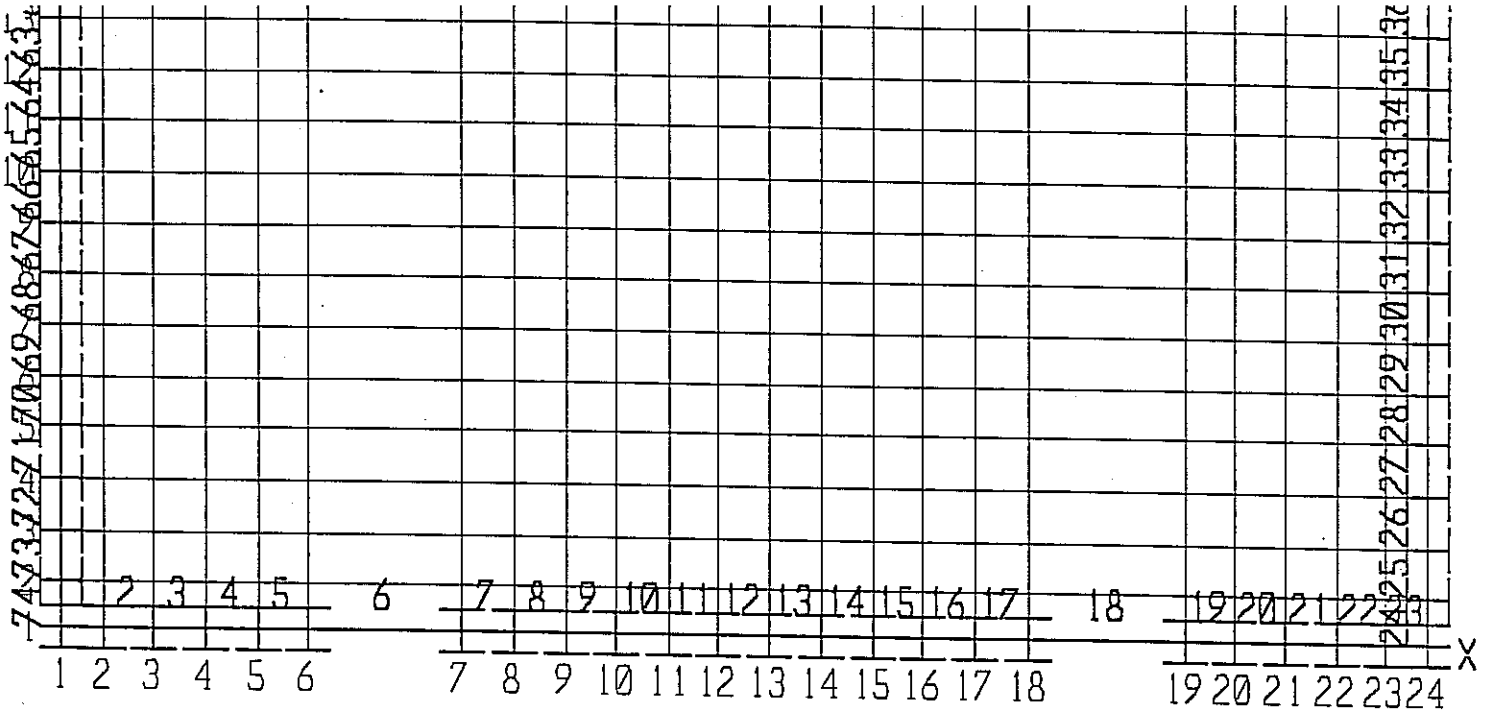
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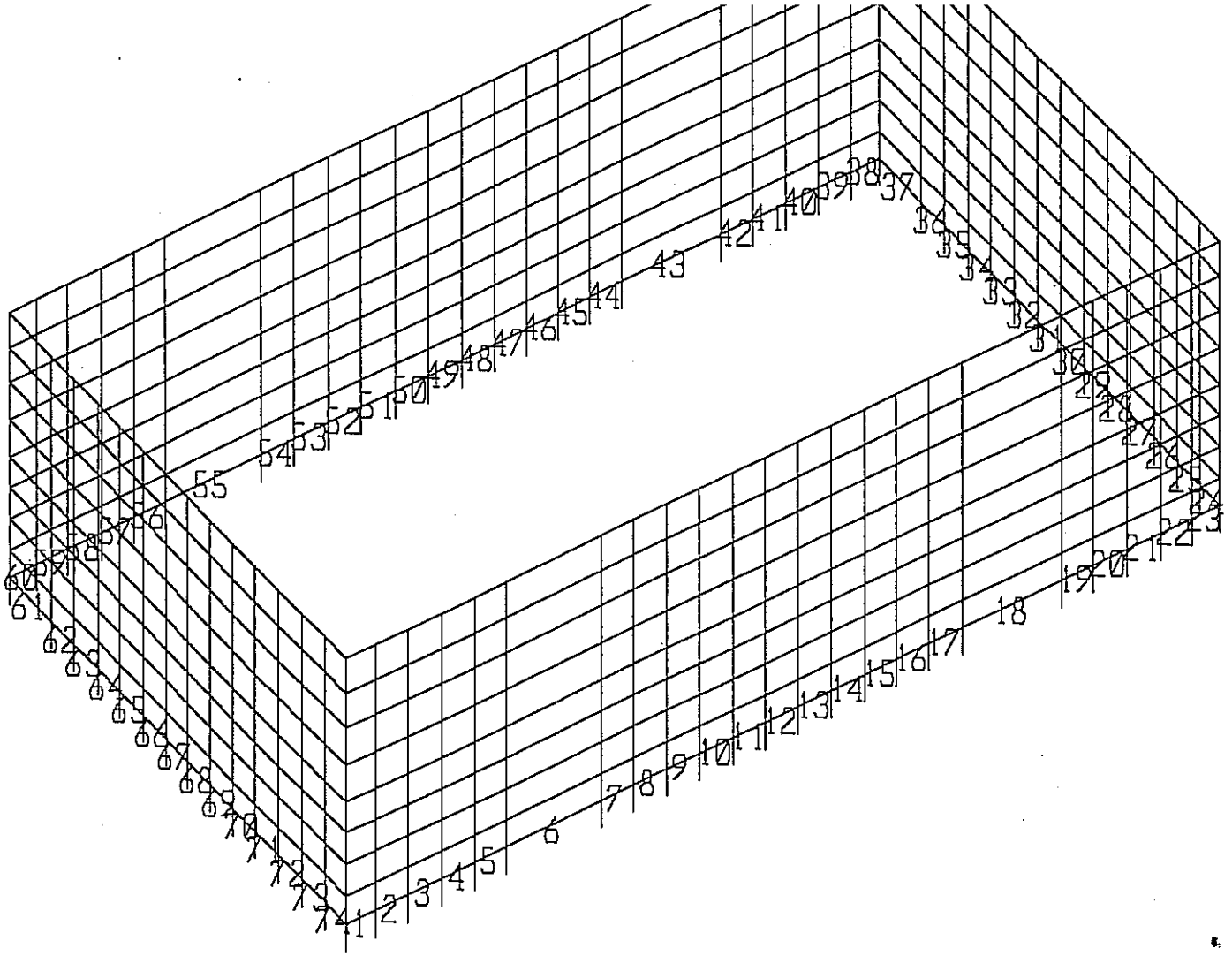

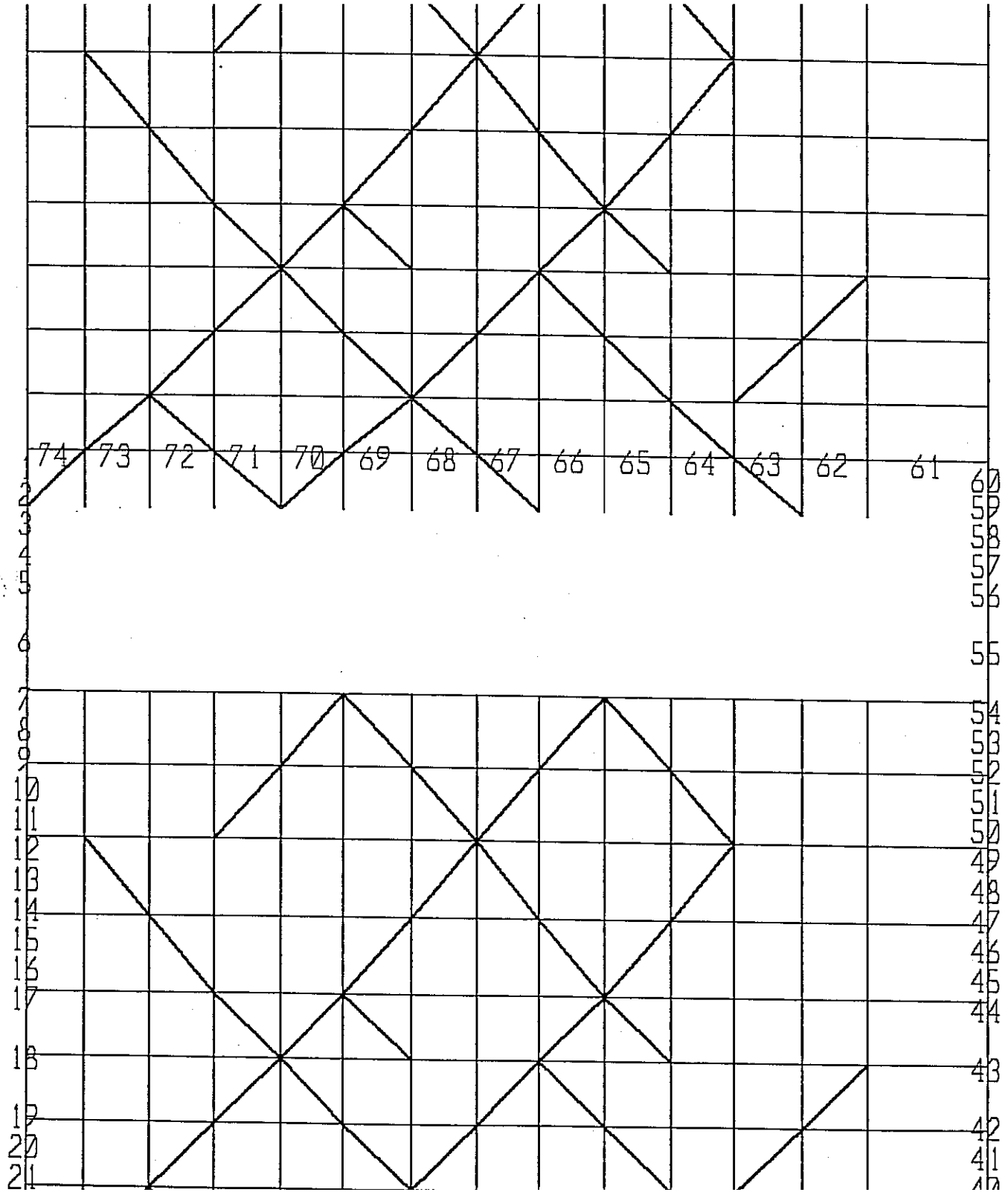
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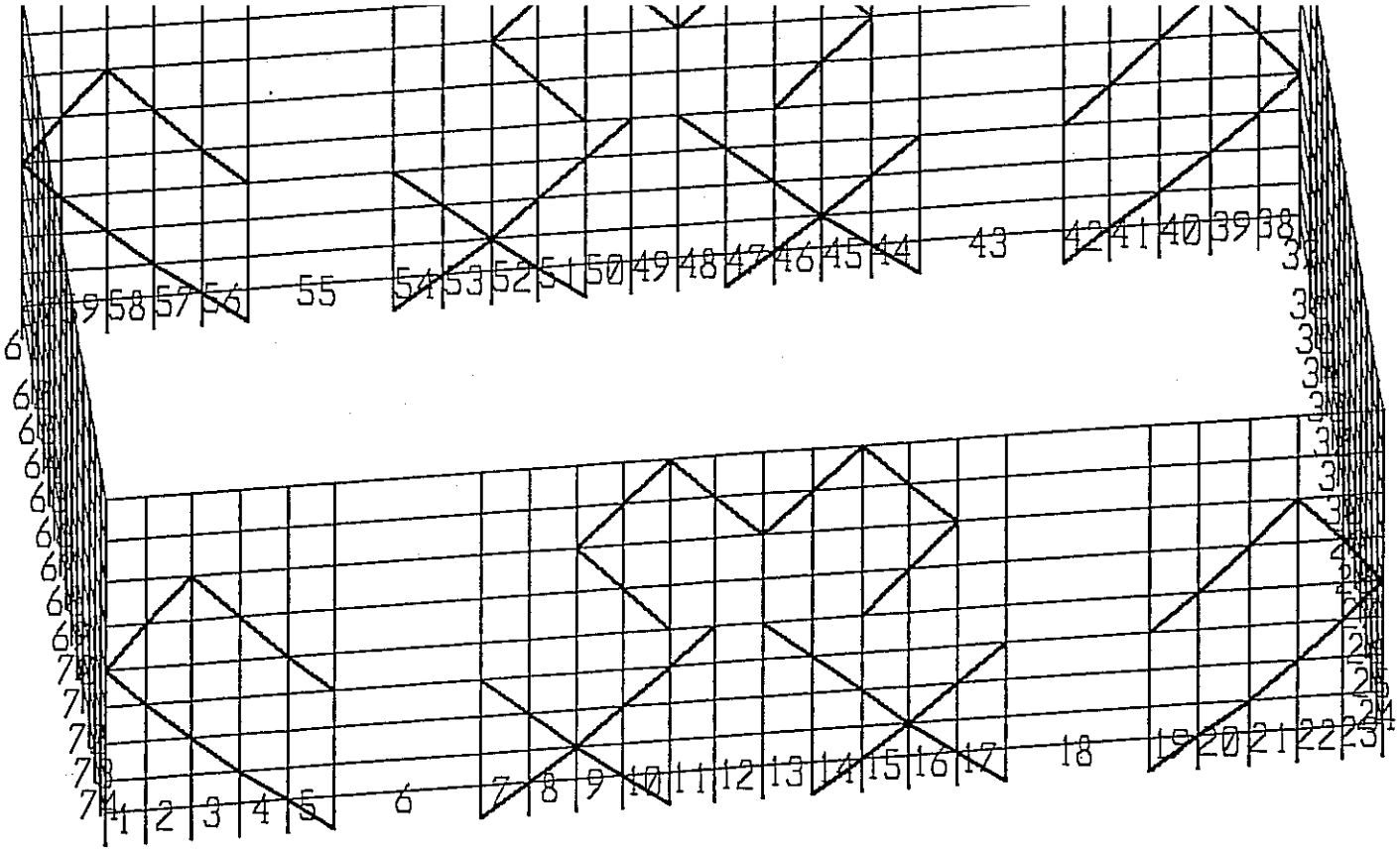

Column Properties

ID	ITYPE	IMAT		DMAJ	DMIN	TF	TW
			for User:	RJ	RIMAJ	RIMIN	
				A	AMAJ	AMIN	J
				IMAJ	IMIN	SMAJ	SMIN
				ZMAJ	ZMIN	RMAJ	RMIN
			for Variable:	IV	L1	L2	L3
				ID1	ID2	ID3	ID4
1	W10X88	1 Steel		0	0	0	0
				1	1	1	
2	W10X77	1 Steel		0	0	0	0
				1	1	1	
3	W10X68	1 Steel		0	0	0	0
				1	1	1	
4	W10X60	1 Steel		0	0	0	0
				1	1	1	
5	W10X54	1 Steel		0	0	0	0
				1	1	1	
6	W10X49	1 Steel		0	0	0	0
				1	1	1	
7	W10X45	1 Steel		0	0	0	0
				1	1	1	
8	W10X39	1 Steel		0	0	0	0
				1	1	1	
9	W10X33	1 Steel		0	0	0	0
				1	1	1	

Beam Properties

ID	ITYPE	IMAT TF for User: for Variable:	DBMAJ TW A IMAJ ZMAJ IV ID1	DAMAJ RJ AMAJ IMIN ZMIN L1 ID2	DMIN RIMAJ AMIN SMAJ RMAJ L2 ID3	 RIMIN J SMIN RMIN L3 ID4
1	W24X55	1 Steel	0	0	0	
		0	0	1	1	1
2	W21X44	1 Steel	0	0	0	
		0	0	1	1	1
3	W18X40	1 Steel	0	0	0	
		0	0	1	1	1
4	W18X35	1 Steel	0	0	0	
		0	0	1	1	1
5	W16X50	1 Steel	0	0	0	
		0	0	1	1	1
6	W16X40	1 Steel	0	0	0	
		0	0	1	1	1
7	W16X36	1 Steel	0	0	0	
		0	0	1	1	1
8	W16X31	1 Steel	0	0	0	
		0	0	1	1	1
9	W16X26	1 Steel	0	0	0	
		0	0	1	1	1
10	W14X30	1 Steel	0	0	0	
		0	0	1	1	1
11	W14X26	1 Steel	0	0	0	
		0	0	1	1	1
12	W14X22	1 Steel	0	0	0	
		0	0	1	1	1
13	W10X33	1 Steel	0	0	0	
		0	0	1	1	1
14	W8X18	1 Steel	0	0	0	
		0	0	1	1	1

Brace Properties

ID	ITYPE	IMAT RJ for User:	DMAJ RIMAJ A IMAJ ZMAJ	DMIN RIMIN AMAJ IMIN ZMIN	TF AMIN SMAJ RMAJ	TW J SMIN RMIN
1	2L4X4X5/16	1 Steel 1	0 1	0 1	0	0
2	2L6X4X1/2	1 Steel 1	0 1	0 1	0	0
3	2L6X4X3/8	1 Steel 1	0 1	0 1	0	0
4	2L4X4X3/8	1 Steel 1	0 1	0 1	0	0
5	2L4X4X5/16	1 Steel 1	0 1	0 1	0	0

Column Properties

ID	ITYPE	IMAT		DMAJ	DMIN	TF	TW
			for User:	RJ	RIMAJ	RIMIN	
				A	AMAJ	AMIN	J
				IMAJ	IMIN	SMAJ	SMIN
				ZMAJ	ZMIN	RMAJ	RMIN
			for Variable:	IV	L1	L2	L3
				ID1	ID2	ID3	ID4
1	W10X88	1 Steel		0	0	0	0
				1	1	1	
2	W10X77	1 Steel		0	0	0	0
				1	1	1	
3	W10X68	1 Steel		0	0	0	0
				1	1	1	
4	W10X60	1 Steel		0	0	0	0
				1	1	1	
5	W10X54	1 Steel		0	0	0	0
				1	1	1	
6	W10X49	1 Steel		0	0	0	0
				1	1	1	
7	W10X45	1 Steel		0	0	0	0
				1	1	1	
8	W10X39	1 Steel		0	0	0	0
				1	1	1	
9	W10X33	1 Steel		0	0	0	0
				1	1	1	

Beam Properties

ID	ITYPE	IMAT TF for User: for Variable:	DBMAJ TW A IMAJ ZMAJ IV ID1	DAMAJ RJ AMAJ IMIN ZMIN L1 ID2	DMIN RIMAJ AMIN SMAJ RMAJ L2 ID3	RIMIN J SMIN RMIN L3 ID4
1	W24X55	1 Steel	0	0	0	
		0	0	1	1	1
2	W21X44	1 Steel	0	0	0	
		0	0	1	1	1
3	W18X40	1 Steel	0	0	0	
		0	0	1	1	1
4	W18X35	1 Steel	0	0	0	
		0	0	1	1	1
5	W16X50	1 Steel	0	0	0	
		0	0	1	1	1
6	W16X40	1 Steel	0	0	0	
		0	0	1	1	1
7	W16X36	1 Steel	0	0	0	
		0	0	1	1	1
8	W16X31	1 Steel	0	0	0	
		0	0	1	1	1
9	W16X26	1 Steel	0	0	0	
		0	0	1	1	1
10	W14X30	1 Steel	0	0	0	
		0	0	1	1	1
11	W14X26	1 Steel	0	0	0	
		0	0	1	1	1
12	W14X22	1 Steel	0	0	0	
		0	0	1	1	1
13	W10X33	1 Steel	0	0	0	
		0	0	1	1	1
14	W8X18	1 Steel	0	0	0	
		0	0	1	1	1

Brace Properties

ID	ITYPE	IMAT RJ for User:	DMAJ RIMAJ A IMAJ ZMAJ	DMIN RIMIN AMAJ IMIN ZMIN	TF AMIN SMAJ RMAJ	TW J SMIN RMIN
1	2L4X4X5/16	1 Steel 1	0 1	0 1	0	0
2	2L6X4X1/2	1 Steel 1	0 1	0 1	0	0
3	2L6X4X3/8	1 Steel 1	0 1	0 1	0	0
4	2L4X4X3/8	1 Steel 1	0 1	0 1	0	0
5	2L4X4X5/16	1 Steel 1	0 1	0 1	0	0

Deficiency	Hazard Level	Implementation & Mitigation
a) Structural (directly related to building structure capacity to support seismic forces):		
Soil Liquefaction Potential	high hazard	soil problems could be solved w/some difficulty
Overstressed foundation	high hazard	pier system could be reinforced w/difficulty
Excessive roof/floor load	high hazard	remove unused/unecessary equipment
Inadequate floor diaphragm	high hazard	reinforce floors w/ in-plane diagonal bracing
Weak flat roofs	high hazard	add roof bracing to strengthen roof diaphragm
Insufficient diagonal bracing	high hazard	provide diagonal bracing to strengthen frame
Poor steel frame connections	high hazard	could be strengthened w/some difficulty
Exterior Wall Panels	medium hazard	panels could be strengthened or replaced
Unbraced Parapets	medium hazard	provide bracing at shorter spans
b) Non-Structural (Non-structural building components or part of other structures in the building)		
Floor-mounted equipment	high hazard	improve equipment anchorage & supports
Roof platforms/catwalks	high hazard	strengthen to avoid vibrations
Duct lateral bracing	medium hazard	strengthen to avoid vibrations
No partition wall seismic joints	medium hazard	could readily be added
No partition wall lateral bracing	medium hazard	could readily be added
No clg compression support	medium hazard	could readily be added
Glazing at entrance	medium hazard	glass could be readily replaced
Staircases & railing	medium hazard	could be readily strengthened
No ceiling seismic joints	medium hazard	could readily be added
No clips on ceiling tiles	low hazard	could readily be added
Light Fixtures Poorly Attached	low hazard	could be readily strengthened
Light fixt./clg separate support	low hazard	could readily be added
Light fixt., stem support	low hazard	could readily be added
Piping, bents	low hazard	provide more anchorage (clamps & supports)
Unseal firewalls	low hazard	could readily be fixed
No pipe flexible joints	low hazard	could readily be added

Oakland, CA 94612					
(510) 839-4330	**ONIZUKA AIR STATION**				
27-Jan-98	**COST ESTIMATE FOR**				
				A (s.f.) =	170,000
	# BUILDING 1003				
				PROJECT CONSTRUCTION BUDGET	**14,792,400**
				Cost/sf	87
a) Structural					
Soil Liquefaction Potential, grout injection		600	CY	500	300,000
Overstressed foundation, reinforce piles		20	EA	10,000	200,000
Excess roof/floor load, remove		1	LS	250,000	250,000
Inadequate floor diaphragm, add bracing		133,000	SF	30	3,990,000
Weak flat roofs, add roof bracing		37,000	SF	25	925,000
Insufficient frame diag. bracing, add bracing		80,200	SF	20	1,604,000
Reinforce steel frame connections		1	LS	950,000	950,000
Partial replacement of heavy ext. wall panels		80,200	SF	40	3,208,000
Unbrace parapets, reinforce		1	LS	50,000	50,000
				Subtotal (a)	11,477,000
b) Non-Structural					
Roof catwalks, reinforce		1	LS	5,000	5,000
No partition wall seismic joints, add joints		1	LS	48,000	48,000
No partition wall lateral bracing, add bracing		1	LS	24,000	24,000
No clg compression support, add support		1	LS	60,000	60,000
No ceiling seismic joints, add joints		1	LS	15,000	15,000
No clips on ceiling tiles, add clips		1	LS	30,000	30,000
Light Fixtures Poorly Attached, reinforce		200	Ea	100	20,000
Light fixt./clg separate support, add support		200	Ea	150	30,000
Roof piping & bents, add anchors		1	LS	15,000	15,000
No pipe flexible joints, add joints		1	LS	16,000	16,000
				Subtotal (b)	263,000
				Subtotal(a+b)	11,740,000
c) Finishing Cost	10%	of	(a+b)		587,000
				Subtotal (a+b+c)	12,327,000
d) Project Cost (A/E, CM, etc)	20%	of	(a+b+c)		2,465,400
TOTAL					